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JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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GAS PURIFICATION
BY
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From ½ to 40 H.P. ind.
See Advertisement in last week's JOURNAL, page 798.

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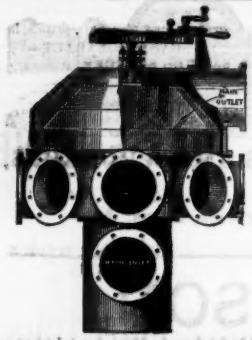
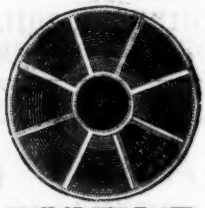
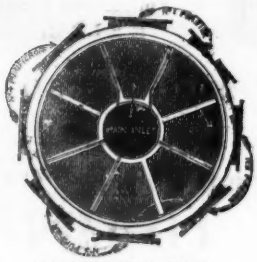


ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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HONOURABLE MENTION
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RETORTS AND FIRE-BRICKS,
Being the Highest Honour given for this class.

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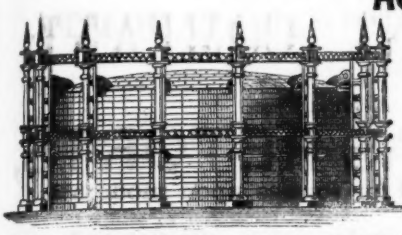

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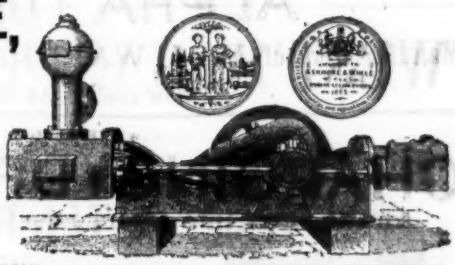

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No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS. MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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GAS PURIFICATION & CHEMICAL Co., LIMITED,
PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

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WEST'S GAS IMPROVEMENT COMPANY.
LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,
And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

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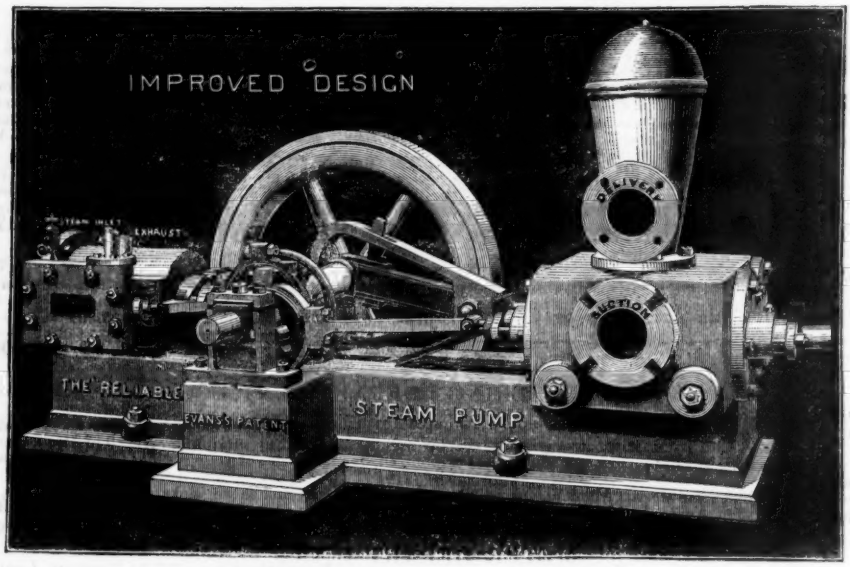
THE "RELIABLE"
IS
THE PUMP FOR TAR AND THICK FLUIDS.

THE ONLY REVERSIBLE PUMP IN THE WORLD.



NEARLY 50 SUPPLIED TO THE GASLIGHT AND COKE COMPANY, LONDON.

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ALSO THE "CORNISH" DIRECT-ACTING STEAM-PUMP.

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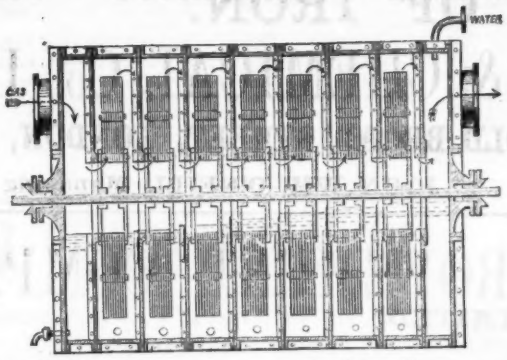
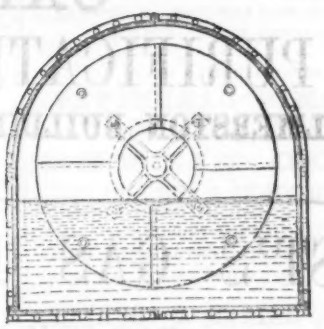
HAND, HORSE, AND STEAM PUMPS FOR EVERY PURPOSE.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Beckton, North Woolwich, June* 8, 1880.

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor and the second with water. Of course the fact of our having ordered two more, in addition to the four which we have in use, is a sufficient indication of my opinion of the value of the Washer. (Signed) G. C. TREWBY.

Messrs. KIRKHAM AND HERSEY. 25, *Palace Chambers, Bridge Street, Westminster, S.W., July* 19, 1880.

Dear Sirs,—The "Standard" Washer which you supplied for use at the Vauxhall station of the Phœnix Gaslight Company afforded me entire satisfaction. It was designed to remove the Ammonia from 3 million cubic feet of gas per day, and during the past winter it did so with a good working margin to spare. It is as excellent now in workmanship as in design, and is well worthy the general acceptance with which it appears to be meeting. I am, faithfully yours, (Signed) CORBET WOODALL.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, it takes out every particle of Ammonia, while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Dec.* 19, 1879.

Gentlemen,—In accordance with my promise that I would inform you as to the working of the "Standard" Washer erected by you here in June last, I now write to say that we are passing through it 100,000 cubic feet per hour (the quantity for which it is made) direct from the Condensers, "bye-passing" the whole of our Scrubbers, which, not being needed, have been standing still since the "Standard" Washer was put in use. It seems as though the Washer more effectually removed the Ammonia when taking the full quantity of gas than less; as, at the present time, at the sixth chamber (there being eleven in all) not a trace can be discovered either by turmeric or acid litmus paper. The difference in pressure between inlet and outlet is only ten-tenths of an inch. I need scarcely say, after the above, how perfectly satisfied I am. (Signed) P. J. WATES, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Messrs. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Dukinfield, Denton, and Haughton Gas-Works, Dukinfield, July 31, 1880.

Messrs. KIRKHAM, HULETT, and CHANDLER, LIMITED, 59, Palace Chambers, Westminster.

Gentlemen,—We commenced the use of your "Standard" Scrubber on the 1st of February last, and from that date to the end of June we had passed 168½ tons of Ammoniacal Liquor of 6° strength into the tar well, as indicated by a liquid-meter. This liquor being sold at 19s. per ton realized £160, which was a clear gain to us of 1s. 0½d. per ton of Coal carbonized, due to the use of your Washer, in addition to which there was a saving in the cost of purification.

During the above period we had removed the Ammonia from 28¼ million feet of gas, and as we make 81 millions yearly, the saving, at the same rate, would be £460 per annum. The Apparatus (without foundations and connections) cost £420, so that it will pay for itself within twelve months of its erection. I am, yours truly, (Signed) HARRISON VEEVERS, Engineer and Manager.

Messrs. KIRKHAM, HULETT, and CHANDLER, LIMITED. *Leominster Gas and Coke Company, Limited, March* 20, 1880.

Gentlemen,—In reply to yours of the 18th inst., we have a 3½-horse power "Otto" Silent Gas Engine; this drives by belt a 5000 feet per hour Beale's Exhauster, Tar, Liquor, and Water Pumps, and your "Standard" Washer-Scrubber. The engine is easily managed, and is sufficient for nearly double the work it has yet had to do. I think a 1 to 1½-horse power engine amply sufficient for a Washer for 7000 to 10,000 feet per hour.

With regard to your Washer-Scrubber, it causes a very decided improvement in the illuminating power of the gas—say 1½ candle; it is now 17 candles by No. 1 Sugg's Argand burner. Clear water supplied at the rate of 10 gallons per ton of coal comes out 5° to 6° Twaddel, and we find the purifiers much freer from tar, and requiring less lime. Our Working Manager says your Washer is the best machine that ever came into the works. Yours truly, (Signed) JOHN F. SOUTHALL.

For further particulars and testimonials, address Messrs.

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Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 5 inches in diameter with lead joint. In either way preventing leakage.

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A STOVE FOR
WARMING AND VENTILATING.
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FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
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No Flue.
No Danger from Fire.
No Offensive Smell.
Light and Warmth combined.
Cost less than other Fuel.

Messrs. RITCHIE & Co. are prepared to supply these Stoves on the best possible terms to Gas Companies to let out to their Consumers on the hire system.
Prices from £3 3s. to £10 10s.
Full Particulars and Testimonials forwarded on application to
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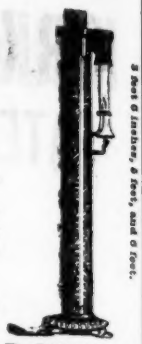
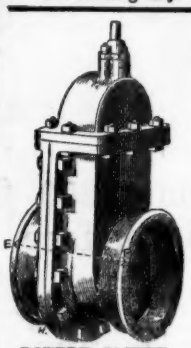


For Light & Heat.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IMPROVED SCREW-VALVES,
For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

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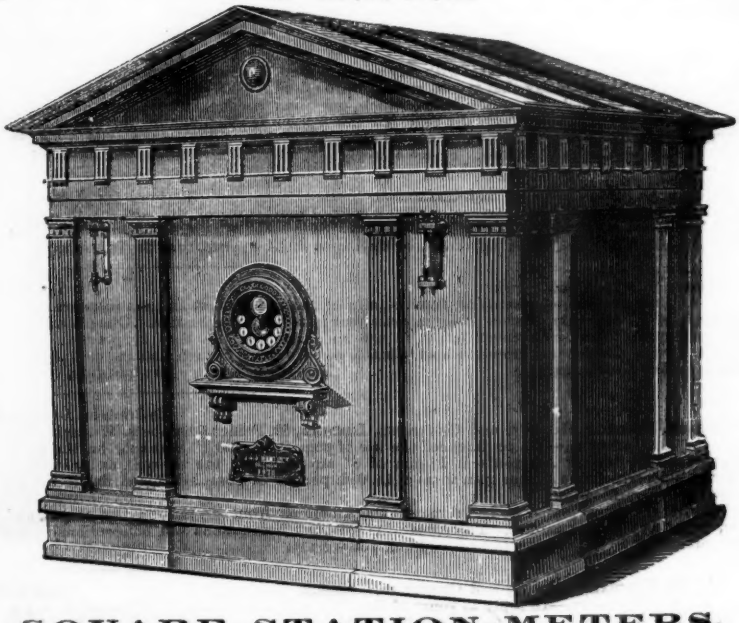
J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET & DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
BRADDOCK'S PATENT COMPENSATING GAS-GOVERNORS;
ALSO LICENSEES AND MANUFACTURERS OF
WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;
ROUND STATION-METERS,
ON CAST-IRON STANDS.



SQUARE STATION-METERS,
WITH PLANED JOINTS.
GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.
GAS COOKING APPARATUS.
Home and Foreign Orders promptly attended to.
All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.
Orders almost invariably despatched on the day of receipt.
TERMS, &c., ON APPLICATION.

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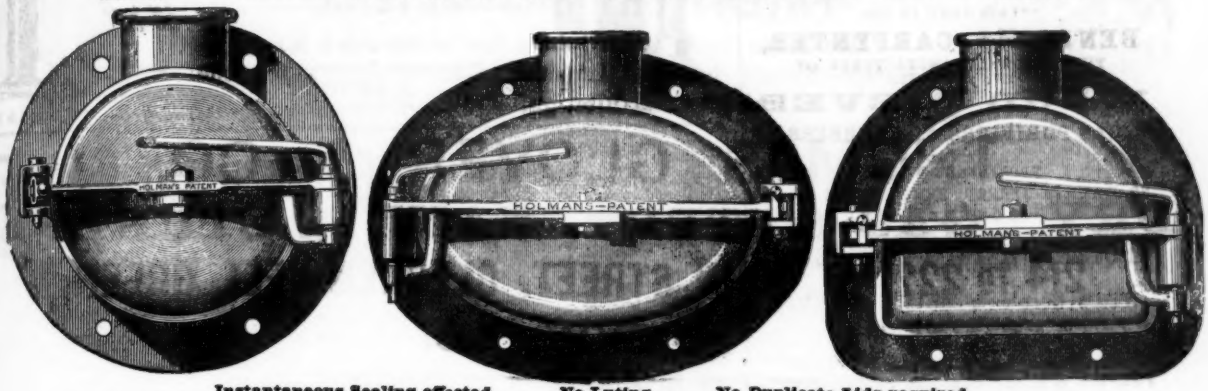
CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and Self-Sustaining Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

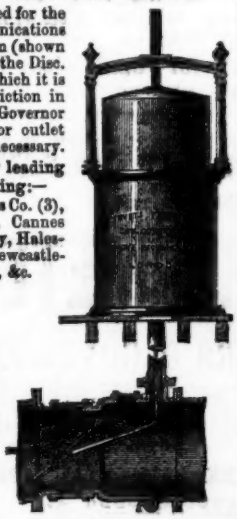
Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

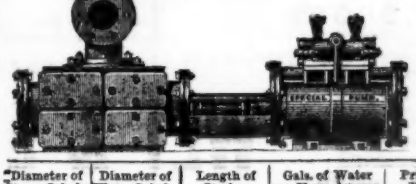
MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

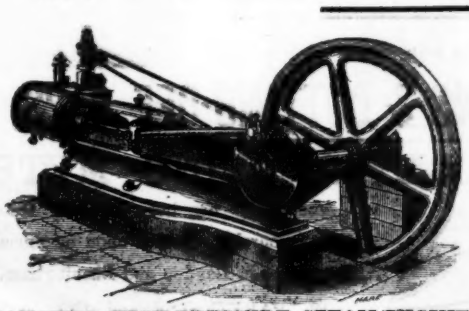
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.

These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.



The quantities delivered of Tar should be taken about two-thirds that of water.

*Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1¼ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2¼ ,,	12 ,,	1,250	21 0 0	22 10 0
*5 ,,	3 ,,	12 ,,	1,830	22 10 0	24 0 0
*6 ,,	3 ,,	13 ,,	1,830	25 0 0	26 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0



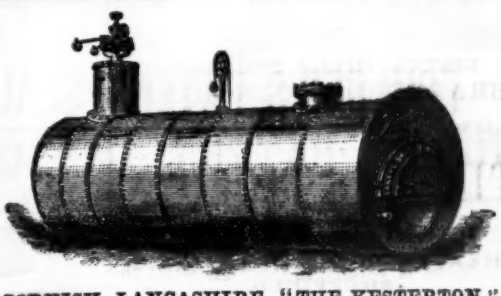
TANGYE'S HIGH-PRESSURE STEAM-ENGINE,

NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

Nom. H.P.	2	3	4	6	8	10	12	14	20	25
	£28	£37	£44	£68	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



CORNISH, LANCASHIRE, "THE KESTERTON," VERTICAL, AND MULTITUBULAR STEAM-BOILERS OF SUPERIOR QUALITY ALWAYS IN STOCK.

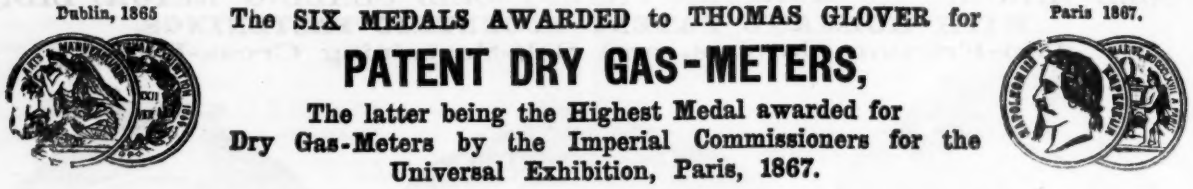
This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES, And all other Descriptions of Tools, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.

London, 1862. New York, 1863. Paris, 1855. London, 1862.

Dublin, 1865 Paris 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

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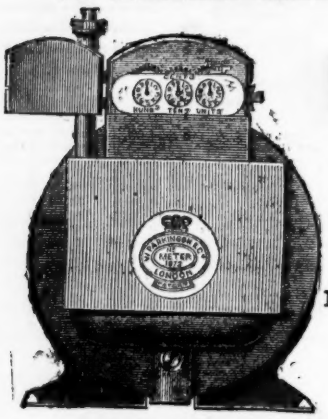
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816)



WET & DRY METERS,

STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

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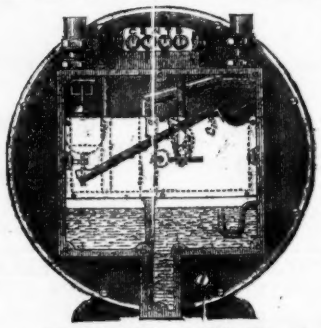
SOLE AGENTS FOR

FOULGER'S PATENT SEAL UNIONS & CUTTING-OFF CAPS.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

D. H.—*We cannot give you the information asked for. You had better make application to the firm you name.*

R. H.—*The information you ask for will be found on p. 384 of Vol. 2 of "King's Treatise on Coal Gas." The description of the mode of testing is too lengthy to re-produce here.—Use an efficient washer or scrubber.*

Current Sales of Gas Products.—*Our attention has been called to the omission of a cypher after the decimal point when quoting, in the* Journals *of the 9th and 23rd inst., under the above heading, the specific gravity of the ammoniacal liquor sold. The figures, of course, should have been* 1·035, *not* 1·35 *as given.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 30, 1880.

Circular to Gas Companies.

The continued existence of the London Gas Company as an independent organization, or its absorption into either or both of the two great Companies now supplying the larger part of London, north and south of the Thames respectively, is certainly one of the "burning" questions of contemporary Metropolitan gas policy. The position of the London Gas Company is geographically so peculiar, that its amalgamation by either of its two neighbours is attended with very considerable difficulty. The business of the Chartered Company is confined entirely to the north side of the Thames, while, consistently with its name, the district of the other amalgamating Company is purely South Metropolitan. That of the London Company, on the other hand, is broken into unequal sections, distributed over the Metropolis in an impartial but perplexing manner, regardless of what was, in the limitation of all the other Companies, accepted as a natural barrier. Indeed, it is very difficult to conceive what could have been the conditions which led the Company to retain so apparently inconvenient a territory, if it was possible, at the time of the general distribution of districts, to obtain, by arrangement with its many neighbours, a more compact one. However the limits of this scattered district may have been determined, it has been efficiently served by the London Company, and there can be no question of disturbing their occupation on the ground of inconvenience caused by those adjoining or surrounding it. But the case is very different if we contemplate the absorption of the Company by either of its two great neighbours. The one effecting the union would, by so doing, not only perpetuate to the other the inconvenience at present impatiently borne, but would have it in its power to render a settlement of the Metropolitan Gas Question, except by the formation of one Company, practically impossible. It is inevitable, therefore, that, pending this consummation, not only would each Company object to the other obtaining such a power, but the Board of Trade would be unlikely to approve a scheme that would seriously interfere with their control over the future policy, or their power to determine the eventual settlement. For these reasons, among others, we believe that it would be waste of time for either the Chartered or the South Metropolitan Company, without mutual agreement, to negotiate an amalgamation with the London Company. No such union would be allowed to take effect, however well satisfied the parties to it might be with the terms agreed upon, without the fullest consideration of other interests. Practically determining as it probably will, at least for some time, the question of complete amalgamation, the issue is too important to be settled hastily, or without hearing all sides.

It has been an open secret for some weeks past that negotiations were afoot between the Chartered and South Metropolitan Companies on the question of further amalgamation. Rumour has not the best of reputations for veracity, but we believe it reports truly in this case, that the object sought in these negotiations is some equitable basis on which a joint offer may be made for the absorption of the London Company. The wisdom, if not the necessity for such an agreement, is sufficiently apparent. Efforts to deal singly would not only, as we have said, be likely to prove abortive, but they might put further difficulties in the way of a final settlement. The London Company seem to be embarrassed by an old perplexity; if not exactly prepared to be "happy "with either" of the two alliances supposed to be open to them, yet their serious consideration of the claims or attractions of each is disturbed by the thought of the other. Competitive offers would both justify past dalliance, and invite a continuance of it.

We have already suggested that these negotiations may well open up the greater question of the combination of North and South into one homogeneous whole. It is impossible to imagine a conference on the subject of amalgamation between two bodies so well acquainted with its advantages as the Boards of The Gaslight and Coke and the South Metropolitan Companies, without such an issue being considered. We believe that the Chartered Company, when it adopted and as it developed the principle and policy of amalgamation, set itself no limitations. Every step thus far of that policy has confirmed its soundness, and it is therefore but natural and logical if the Company should desire to carry it through to completion. From this point of view the proposed division of the London Company, and the merging of the portion north of the Thames into the Chartered Company, while that on the south is joined to the South Metropolitan Company, deserves, and will no doubt receive, grave consideration. Such an agreement, if arrived at, will declare that no expectation whatever is entertained of the formation of one Company, but that the river is tacitly accepted as the natural division between the operations of the two. It is not our purpose here to discuss the relative advantages of one Company or more; much can be, and has been said in favour of the continuance of two independent and, in a certain sense, competitive supplies. At the same time such rivalry, whether in the broad, gross sense, or when confined to the "competition of comparison" to be used before Parliamentary Committees or elsewhere, has always been to the detriment of the Companies. This moral has been so often and painfully pointed, that there is little danger of its being overlooked.

Returning, however, to the present suggestion of a joint offer to the London Company, there should be little difficulty in arriving at a fair basis. The respective values of the two divisions are readily determinable, and as the value of The Gaslight and Coke Company's "A" stock is nearly identical with that of the South Metropolitan Company's "B" stock, the Shareholders of the London Company would probably be equally content with either. To receive an equivalent in these stocks for the nominal value of their own, would be a

happy exchange for them, and at the same time would, we suppose, be readily offered. If the present large proportion of preference capital of the London Company is continued as preference, its value will be increased, because even in the Chartered Company, and following the several stocks already preferred, the proportions of ordinary stock guaranteeing it will be considerably larger than at present; while if, in deference to the wish of the Board of Trade to bring as much capital as possible within the operation of the sliding scale, it should be converted into ordinary stock, a fair equivalent would, of course, be given. Whatever may be the views of the Directors of the London Company as to the value of a guaranteed dividend on their ordinary stock, it is useless to discuss it here, because an amalgamation on such terms could not be approved by the Board of Trade without stultifying their repeated declarations in favour of subjecting all the capital possible to the inducements and terrors of the sliding scale. The disposal of the works of the Company may also possibly be an element of some perplexity. They are on the south side, while the greater portion—some two-thirds—of the consumption from them is on the north. The South Metropolitan Company intend next session to seek powers to erect new works at East Greenwich, and will certainly not surrender that intention even if they become possessed of the London Company's station at Nine Elms. The margin of producing power which they would have there, if the northern district were to be directly supplied by the Chartered Company, would meet the increase in South London for about three or four years only, and thus would simply give time to get the new station into working order. But we shall be greatly surprised if the Chartered Company are in a position to undertake an increased supply of some 1000 million cubic feet of gas per annum, in addition to their regular and enormous annual increase, from their existing plant. The natural solution appears to be that while the South Metropolitan Company retain the works, they should for some time to come supply in bulk to the Chartered Company the gas required for the northern districts, leaving to the latter Company the distributing of it. Although the works of the London Company are well placed, and in admirable condition, yet their value, as represented in the Company's capital, is so considerably greater than that of their equivalent erected now, and on such a site as the Greenwich marshes, that it is certain the Company taking them will require some share of this extra charge to be borne by that which takes rental only. Such questions as these will naturally require consideration by the two Boards, but they seem to present no great difficulty. If it is agreed that the effort shall be made to unite the London Company, not with one, but with both the others, then, it appears to us, all else should be easy. A settlement on this basis may not be the very best that could be arrived at, but it would certainly, for all the parties to it, be an improvement upon the *status quo*.

The annual report of the Administration of the Berlin Municipal Gas Undertaking, which will be found in another column, is, as usual, of a highly interesting character, and affords much information of value for the purpose of comparison with similar statements concerning our own undertakings. By similar statements we mean the fullest accounts obtainable of the contemporary transactions of English establishments. No English reports of the working of corporation or companies gas undertakings are comparable in wealth of detail to the exhaustive statements of German administrations, and it is this great distinction, as well as the particular facts mentioned in the Berlin report, to which we here wish to direct attention. On perusal of the report, it will be seen that every possible development of the subject, which can be brought into the domain of statistics, is carefully scheduled for comparison with the records of previous years; and the special numerical facts are, wherever possible, reduced to proportional expressions. In our own gas reports the efforts of the compilers in this direction seldom extend beyond bare statements of absolute increases or decreases in sales and returns, with perhaps the increase in the consumption of gas, and the amount of gas unaccounted for, shown in percentage relation to the previous year's accounts. Even this is not always done, but more than this is very exceptional. If we turn, for example, to the reports of the Directors of any Metropolitan Gas Company, or of any of the larger provincial undertakings, under corporate management or otherwise, it will be found that a few generalities as to having had a successful year or half year, as the case may be, leading up to the announcement of the proposed dividend, or to the declaration of the net profits, are all that, in most instances, are considered necessary by administrations in the way of giving an account of their stewardship. But such is far from being the German practice, as the present example shows.

Here we have, to commence with, all that ought to be said on our system, but too often is not, by the Chairman in general meeting, when moving the adoption of the report, with the advantages that so much does not depend on the eloquence of the occupant of the chair, and that the explanations given of the causes that may have influenced business during the stated period can be made with greater clearness and force. Then we have all the circumstances of the consumption minutely set out, not only as to how much gas has been sold, but what proportions have been taken by various classes of consumers; sometimes—as is the practice of the German Continental Company—recording the quantities and proportions taken by the different trades, factories, railway companies, &c. The value of accurate returns of this kind, in showing how the gross consumption is divided, and, consequently, how the rental is contributed, cannot be gainsaid. Then we find the statistics of production dissected with equal minuteness. The actual quantities and ratios of the yearly, daily, and hourly manufacture and distribution of gas are noted, and made the bases of exhaustive comparison with what has gone before. As to the value of this, again, there can be no question, more especially as a gauge to be applied to the capabilities and necessities of the manufacturing and distributing plant. The carbonization of the coal used, respecting which so much has been written of late in our columns, is made no secret at Berlin. It will be seen that the rate per ton—10,117 cubic feet—is not excessive for coal which is said to yield its gas freely; and th fact that slightly over 9000 cubic feet per mouthpiece is the average daily production, shows that the management of the high heats produced by the generator furnace is in accord with the principles laid down by Dr. Schilling, and mentioned in another part of to-day's JOURNAL. Before leaving this part of the subject, it may be pointed out that as only 54 per cent. of the retorts at Berlin are heated by generator furnaces, it must be assumed that the rate of production per mouthpiece is higher for this portion than the average, in order to allow for the necessarily lower rate due to the remaining retorts heated on the old system. If this be so, the Berlin authorities must have been enabled, in some way, to surmount the difficulty of stopped pipes, supposed to be inseparable from a larger yield of gas than that herein given. In view of the observations contained in the report, it may thus be conceded that, in the matter of carbonization, the management of the Berlin Gas-Works takes a place in the front rank.

The remaining portions of the report speak for themselves. The pervading spirit of statistical analysis will be seen to be carried into the figures having reference to the mains and services, so that from year to year it is easy to follow the extension and development of the undertaking in every department, from the retort to the consumer's burner.

It may be said that the Berlin undertaking, being under corporate management, has the less reason to fear anything from a full publication of its affairs; but the same practice obtains, even more fully, as we have said, with the German Continental Gas Company, of which organization Herr Oechelhäuser is Engineer-in-Chief. In fact, the whole of the German and most of the French gas companies appear to revel in the publication of the statistics of their operations, as though their managers gloried in enlarging upon the development of the establishments they have official charge of. We confess to a desire to see this manifestation of pride in a gas undertaking, and the loveof dwelling on the minutest details of its existence, more general in our own country than it has yet appeared. It is difficult to see what objections can be made, with any real weight, against a publicity that might almost be thought ostentatious. Gas companies do not carry on a secret industry, their emoluments are not hidden, and while the only elements that can possibly attract the cupidity or the animosity of rivals or enemies are made common property, it cannot be considered impolitic to publish other matters which must infallibly be of benefit to the profession, and indirectly to the community, while reflecting credit, it may be hoped, on those who have the control of the undertakings. None but bad managers, self-convicted, could object to their work being made generally manifest, and the convenience of such persons is hardly worth consideration. The Berlin Municipality have a good account to give of their gas-works, and they are not afraid to inform all the world of the fact. Are we so sure that in every case our own undertakings would bear to have such a blaze of light thrown upon their minutest details? It may be urged that the managers of works and their directors know all these things, and that no one

else has any concern therewith. We hope it is so, and that the picturesque treatment of statistics common to our Continental friends is not due in any way to their having the necessary facts more fully tabulated, and more constantly before them. It is certain that if British gas-works, with the infinite gradations of circumstances under which they exist, were to furnish annually, or semi-annually, detailed statistics of their structural and economical progress, so as to be susceptible of collation and analysis, in a comprehensive manner, by a national "Field," we should be put in possession of a better standpoint than anything we now have, from which to estimate the management of gas undertakings.

In continuation of our observations, in last week's "Circular," in reference to the notices of intended applications to Parliament in respect to gas undertakings in the forthcoming session, we may remark that the Hyde Gas Company make their appearance again as aspirants for extended powers. It will be remembered that the last Bill which the Company promoted was rejected. The present notice embraces the acquisition of lands, the extension of the Company's works, and the raising of additional capital. The Company also desire power to supply gas-fittings, and to make further provisions with respect to the supply of gas. The proposed Bill will affect the Hyde Gas Act, 1855, and the Dukinfield and Denton Local Boards Gas Act, 1877.

A re-commencement of hostilities is threatened from the Isle of Thanet. We have already referred to the proposal of the Thanet Gas Company to appropriate a certain district lying just without their limits of supply, and at present lighted by works in the hands of Mr. Davis, of Westgate-on-Sea. Mr. Davis has given notice of his intention to take the field again for the purpose of retaining the district he has practically made his own for some years past, so that a lively contest may be expected on the two Bills. If possession is as large a factor in this case as it is popularly supposed to be in common law, the Company may be expected to have some difficulty in proving their right to the desired territory, although Mr. Davis has perhaps experienced sufficient trouble in Parliament and also in the Law Courts to induce him to become rather weary of a position which he can only maintain by combat. It may, however, be expected that the coming session will settle the question, for one or both parties, for some time to come.

The Richmond Gas Company intend to apply for an Act to increase their capital, to enable them to extend their works and to acquire additional land. The Company also desire to construct a siding from the London and South-Western Railway into their works. It is intended to remove the testing-station for the Company's gas from the works at Mortlake to a site in the town of Richmond. The notice also contemplates certain alterations in the qualification of Directors, &c.

Application is to be made to the Board of Trade for a Provisional Order by the Brentford Gas Company, to enable the Company to raise additional capital, to define their district, and to acquire additional land. The Company desire powers to supply gas in bulk, and to be enabled to purchase the residual products of any other Gas Company for conversion, or to sell their own products to any other Company authorized to manufacture their own products, and to empower such Company to manufacture the same.

The gas supply of Lytham is about to be placed on a fresh footing—that is, if the Local Government Board consent to further the wishes of the Improvement Commissioners. Up to the present time it has been the practice to include the gas accounts in the general district accounts, any surplus from the revenue going to help the improvement rate. It is now proposed to keep the gas property separate, and the reasons offered at the late Local Government Board inquiry for doing so are instructive. Since 1878 the district under the control of the Commissioners has been greatly enlarged, a considerable area of a strictly rural character having been added by a Provisional Order obtained in that year. Under existing regulations the ratepayers of the added area are relieved at the expense of the gas consumers of the old district; and this has appeared to the Commissioners an inequitable arrangement, which they desire to have altered. The gas consumers maintain the works and pay interest on the capital sunk in the undertaking, and this should surely be enough without calling on them to pay farmers rates. In this case the Commissioners will probably succeed in attaining their object, as the question is propounded in a striking form. It must be a true principle that holds good in *minima* and *maxima*. There is no essential difference between the cases of little Lytham and big Manchester, and there is no greater injustice in expecting a village gas consumer to pay rates for his country friends than in demanding from one citizen payment of rates due from his neighbour. Only in the one case the mistake is self-evident, and in the other it is too large to be seen. Still, those who cannot learn from the greater example may perhaps do so from the smaller, and may in the end come to acknowledge that one rule applies to both.

In two towns in Scotland an effort has been made during the past week to introduce the Burghs Gas Supply (Scotland) Act, 1876, and in both places the originators of the movement have been signally defeated. In the town of Kilsyth, which lies under the shadow of the Campsie range, and the total population of which is somewhere between 4000 and 5000, the local legislature has been terrified by the ghost of electric lighting, and so nervous, indeed, have they become, that they have resolved to delay consideration of the adoption of the above-named Act for six months. The local Company, therefore, have a lease of life for that period; but if dynamo-electric machines, and a practicable and economical method of distributing the element that is thus generated, are not perfected by the summer of 1881, the gas undertaking most assuredly will be found merged in the Corporation. The other town referred to is Helensburgh, where they have recently had quite enough to do in matters political and ecclesiastical. In this sea-coast town a movement has been long on foot to acquire from the local Gas Company the well-equipped works managed by Mr. Smith, and it was really anticipated that ere this time the works would have been in the hands of the Corporation; but those who have looked forward to the realization of such an event have been doomed to disappointment, for the Council, being equally divided as to the propriety of moving in the matter, the Act will not be adopted just now. There is, however, reason to suppose that this division does not represent the true feeling of the Town Councillors on the subject, and that it is the result more of the influence of local politics than of a feeling adverse to the adoption of the Act.

We continue this week our notice of the proceedings of the American Gaslight Association at their last meeting, by giving the discussion on Mr. Forstall's valuable paper on stoppages in ascension-pipes. The subject of the paper, so threadbare that only the boldest gas manager would willingly choose it as a theme for a discourse to his associates, afforded the author an opportunity of showing how attractive freshness of illustration and vigour of handling can make an old text. Mr. Forstall leaves very little to be said on the subject, which perhaps accounts for the somewhat pointless character of the subsequent debate, when nothing of striking novelty or value was elicited.

Mr. Davis's paper on the residual products of gas manufacture, read before the Manchester Scientific and Mechanical Society, on Friday last, and reported in another column, is rather entertaining. He treats the subject entirely from the point of view of the chemical manufacturer, and it will be a new experience for some gas managers to find how they are regarded by outside dealers in residuals. According to Mr. Davis, gas manufacturers frequently possess a diabolical ingenuity in deceiving the helpless purchaser of ammoniacal liquor and tar, by deteriorating the quality of these products for the sake of purifying the gas. This is certainly one way of looking at the question, and we were not prepared to be told that, in bargaining with manufacturing chemists, gas manufacturers always have the advantage. On Mr. Davis's showing, the valuation of ammoniacal liquor by degrees of Twaddel is invariably to the advantage of the seller. This is, at least, doubted in many quarters. In other respects, also, Mr. Davis's remarks are equally ingenuous, and the paper shows an odd mixture of accurate knowledge and gratuitous assumption. As it appears by the author's own statements that he is no longer actively engaged in the trade in gas chemicals, his slight stumbles may well be pardoned for the sake of the generally interesting character of his present communication.

It is proposed to hold an Exhibition of Heat, Light, and Ventilation at the Alexandra Palace about the close of the present year. The project has only just been reduced to tangible form, and it is therefore impossible to foresee how it will eventuate. Gas heating and lighting apparatus will, in all probability, form the chief portion of the exhibits, although coal ranges and oil lamps will be equally admissible.

There is plenty of scope for a series of reliable tests of the relative efficiency of modern cooking ranges and gas stoves, and a discussion of the respective advantages of coal and gas for culinary purposes would be a positive relief from the unending controversy between the partizans of gas and electricity on the great lighting question. We wish the promoters of the scheme every success, which they will certainly attain if they can manage to endue their proceedings with any sort of novelty.

Water and Sanitary Notes.

The erroneous nature of the judgment pronounced on the London Water Companies by Sir W. Harcourt's Select Committee, is well set forth in respect to the Lambeth Water-Works Company in the report of the Directors, to be laid before the Proprietors at their half-yearly meeting to-day. In the case of this Company there is clear proof that Mr. E. J. Smith was right, and the Committee were wrong, in estimating the probable growth of the annual income. The increase of rental proves to be greater than was calculated, and 418 more houses have been laid on during the past twelve months than in any previous year. The extent to which the rates have been raised is shown to have no material effect in adding to the income, the addition from this cause in the course of seven years being only £3477, whereas the total annual rental now amounts to £154,000. The idea that the future capital expenditure of the Company would be at the same annual rate as in the past, is also shown to be fallacious. It is well argued that if this notion were true, then the Company who had laid out most money in perfecting their works, would be under the necessity of laying out most money in the future. The Lambeth Company have expended in recent years nearly a quarter of a million sterling in removing their intake to Molesey, and there constructing large subsiding reservoirs, building on suitable high ground capacious service reservoirs, extending the filtration area, and putting their works generally into an efficient state. But the Company having expended so much money, the Committee chose to consider that the same outlay must be repeated over and over again, and Mr. E. J. Smith was unable to make them accept his estimate. We must speak with respect of the Select Committee which sat last session; but the fact is that no Water Company could be right in the opinion of that Committee. If there was little expenditure on works, it would be assumed that the latter had fallen into a bad condition, and would require a larger outlay in the future. If, on the other hand, the works had been well cared for, it was considered that the expenditure in the future would be the same as in the past. Concerning the impolicy and injustice of introducing a competing supply by means of public funds, the Lambeth Directors speak very clearly and strongly. It is shown that the question is not one as to the existence of a monopoly. The Water Companies are in the position of private enterprises based on distinct Acts of Parliament; and "without prior compensation, Parliament does "not permit public money to be used to compete with, and "diminish the value of parliamentary private enterprise." If this recognized principle were violated, "there is no par-"liamentary Company which could not be annihilated by "the use of public money in the construction of duplicate "competing works—a railway company, for instance, by "parallel lines—and no property would be safe." Probably the time will come when the public will see the Metropolitan Water Question in a somewhat different light from that in which it was presented by the report of the Select Committee, and in which it has been viewed by the generality of journalists. The Press, with rare exceptions, has not done justice to the Water Companies, and the latter have also been made to suffer from the conflict of political parties.

The Metropolitan Vestries, while generally ready to agree that the Water Companies should be got rid of, are not so well able to decide as to who shall take the place of these corporate bodies. The other evening the Marylebone Vestry assembled in great force to sit in judgment on "certain "persons who have been holding a conference at the Vestry "Hall of St. Martin's-in-the-Fields, and adopting a memorial "to the Secretary of State for the Home Department on the "subject, purporting to represent the views of the several "Vestries and District Boards of the Metropolis thereon." A report was presented to the Vestry from a Committee who had been deputed to consider the subject, and in this report the Committee stated that while they were not at present prepared to recommend a definite plan for the constitution of a public body to take charge of the water supply, they felt it their duty to "strongly deprecate the steps that are being "taken by a few Delegates of some Vestries and District "Boards" in pressing on the Government a scheme for the election of a "Water Trust" in a similar manner to that of the School Board. The discussion which followed appears to have been unanimously against the Delegates, who were condemned as usurping authority which did not belong to them, and as promoting a scheme from which the Marylebone Vestry entirely dissented. The report of the Committee was adopted, and was ordered to be sent to the Home Secretary, who will thus find that there are many "voices from the "crowd." This result agrees with our anticipation that the Vestries would not look with favour on the creation of an authority independent of themselves, and we are certainly surprised that the Delegates at St. Martin's-in-the-Fields so misunderstood the feelings of their constituents.

Mr. John Runtz is reported to have made an inexplicable announcement at the meeting of the Hackney Board of Works last week, to the effect that "in the course of a few "days a well-known firm of Parliamentary Agents would "give the statutory notices for a Bill for the creation of a "Water Trust for London on a representative basis." Messrs. Martin and Leslie would appear to have done as much as this, and a little more, prior to the utterance of Mr. Runtz at Hackney; in addition to which it is now rather late, though possibly not altogether too late, to talk about "statutory notices" for a Bill of this kind. At all events, if anything is to be done in the way proposed, the world must see some sign to that effect to-day. Perhaps Mr. James Beal and his friends are anxious to put in an appearance.

The Lower Thames Valley Main Sewerage Board are going to Parliament next session for an Act to authorize payment of the costs incurred by them in promoting their Bill of 1879. It might not be amiss if at the same time the Board obtained power to shorten their inconveniently long title. Concerning their costs, it seems to be a very common thing in these days for Boards to go beyond their legal powers in spending money. Either the law is stricter than formerly, or Boards are growing lawless. Surcharges, remissions, and Bills of Indemnity point to a lax and bungling way of transacting public business.

Notice is given of a very peculiar Bill to be promoted in Parliament next year. It proposes the incorporation of a Company to be entitled the "Manufacturers and Millowners "Mutual Aid Association," the avowed object being "to pro-"vide means for giving practical effect to the measures "adopted by Parliament for preventing the pollution of "rivers and streams of running water by any noxious "matters, and for cleansing and utilizing the same." This highly beneficent scheme also includes the lending of money to local authorities to enable them to dispollute their rivers and utilize the refuse matter. Altogether it is a very odd notice, but as there is some allusion to a division of profits and a first charge on lands, revenues, and rates, we presume somebody expects to be the better for it. Parliament might at least be thankful if many other "Associations" were formed "to provide means for giving practical effect" to its statutes, especially those affecting the public health.

Considerable progress has been made during the past summer with the water-works now in course of construction for the Bradford Corporation. The Idle Hill reservoir, intended to hold a few days supply for the high-level service in the Idle, Eccleshill, and Bolton district, has just been completed, and is situated on the summit of a hill at an elevation of 745 feet above the sea level. It will hold 5,500,000 gallons of water. High-level works are also in course of construction at Thornton Moor, being the last instalment of such works for which parliamentary powers were obtained in 1872. An Act obtained in 1868 provided for the construction of two other reservoirs in the Oxenhope Valley—one at Stairs, and the other at Shady Bank—but it is said to be unlikely that these will ever be made, partly owing to the immense engineering difficulties which would have to be encountered, and partly because the storeage capacity of the high-level service, when the works at Thornton Moor are completed, will be nearly sufficient to exhaust the drainage area. The reservoir at Thornton Moor is 1240 feet above the sea level, and has a storeage capacity of 185 million gallons. The works connected with this part of the undertaking are very extensive. Barden reservoir, which is the mainstay of the low-level service, is situated seventeen miles from Thornton Moor, and has a capacity of 450 million gallons, but is utterly inadequate to impound all the available supply, and for two or three years past works have been in progress for the construction of another large storeage reservoir in the same basin, about two miles distant.

WATER LEGISLATION FOR 1880.

HAVING completed our notices of the Acts in reference to gas supply which were passed in the last sessions of Parliament, we now proceed to give a summary of those relating to the supply of water. We shall commence with the Companies incorporated, of which there were two, as follows:—

The *Dearne Valley Water-Works Act* incorporates a Company for the supply of water within certain parishes and townships in the valley of the Dearne, in the West Riding of Yorkshire. The capital of the Company is £30,000, with power to borrow £7500 on mortgage. The supply of water is to be obtained by pumping, from a station situate in the township of Wombwell, whence a line of pipes is to run to a service reservoir in the township of Hoyland Nether. The Company take power to purchase by agreement six acres of land for offices or buildings only, in addition to the proposed sites of their stations, which they may acquire compulsorily. The works are to be completed in five years. Water may at any time be supplied constantly by order of the Local Government Board. Water for all domestic purposes is to be supplied at a rate not exceeding six per cent. on the annual rack-rent or gross rateable value of the premises, with additional rates for extra water-closets and baths. The Company may supply by meter water for other than domestic purposes, at rates not exceeding 1s. per thousand gallons for any quantity up to 50,000 gallons per quarter, and 10½d. per thousand gallons for any further quantity. The Company may supply water in bulk to neighbouring sanitary authorities, provided that such supply can be afforded without detriment to the Company's domestic supply. The Company may also supply any water or sanitary fittings to persons using their water.

The *Portmadoc Water Act* repeals the Portmadoc Water Order, 1871, incorporates a Company, and vests in the Company the undertaking authorized by the said Order, and grants powers for the construction of additional works for the supply of water to Portmadoc and its vicinity. The Order now repealed authorized two persons to construct works and supply Portmadoc with water, with an expenditure of £8500. One of the parties sold his portion of the undertaking to three persons, who, with the other original undertaker, form the Company incorporated by the Act. The capital of the Company is £20,000, whereof £8500 is made original capital, and the remainder is the additional capital authorized by the Act. The Company may borrow £2125 on mortgage in respect of the original capital, and £2875 in respect of the additional capital. Dividends on the new capital are limited to seven per cent. on ordinary, and six per cent. on preference capital; all classes of capital to bear proportionately any decrease of dividend. The limits of supply include the parishes of Llandecwyn, Llanfihangel-y-Traethau and Llanfrothen, in the county of Merioneth, and Ynyscynhaiarn, in Carnarvonshire. The Company may continue to use the water-works of the original undertaking, and may construct additional impounding and service reservoirs and lines of pipe, all to be completed within ten years. In addition to the lands to be acquired compulsorily, the Company may take ten acres by agreement. The supply of water is to be regulated by gravitation. For domestic purposes, water is to be supplied at the rate of 8s. 8d. per annum for cottages of less than £7 annual value; for houses of more than £7, but less than £30 rental, at the rate of seven per cent. on the rack-rent.; and at 6½ per cent. on the rental of houses of more than £30 annual value. Additional rates are chargeable for any extra water-closets and baths, the latter according to size. The Company take powers for the supply of water in bulk, by meter or by agreement, and also to supply water and sanitary fittings to users of their water. The Company are compelled to supply water to vessels lying in Portmadoc Harbour, and to deliver the water on board at a rate of one halfpenny per ton on the registered tonnage of such vessels, no tonnage to be computed at less than fifty tons. Crown rights to minerals, and to the waters of the lake from which the Company draw their supply, are reserved.

Four Water-Works Companies obtained extensions of powers during the past sessions:—

The *Cardiff Water-Works Company's Act* amends some of the provisions of the Cardiff Corporation Act, 1879, and confers further powers upon the Cardiff Water-Works Company. In the Corporation Act, 1879, it was recited, among other things, that the Company had agreed to dispose of their undertaking to the Corporation on certain conditions; and it was provided that the consideration for the transfer was to be £300,000, to be commuted, by agreement, for four per cent. annuities or Corporation stock. Section 20 of the Act contained a paragraph stating that the application of the purchase-money was to be as follows:—"In making a fair "rateable division of the residue" (after all debts and liabilities had been paid) "among the several persons whose "names appear at the vesting period in the transfer books of "the Company as proprietors of stock or shares in the capital "of the Company, or their respective executors, administrators, or assigns, in proportion to their several shares and "interests in such capital." It now appears that doubts afterwards arose as to the construction of this section, and the Company were advised that it did not bear the construction they desired, in order to apply the purchase-money in the manner contemplated at the time of the passing of the Act—namely, in a fair rateable division (after payment of debts) among the proprietors in proportion to the value of, and the dividend paid upon their stock and shares—but that the rateable division would have to be made in proportion to, and with reference only to the nominal value of such stock and shares. The present Act repeals the section in question, and substitutes a provision for the payment of compensation to officers and servants of the Company, and for the payment to proprietors of stock or shares of twenty-five years purchase of their maximum statutory dividends, and for the division of the surplus among the said proprietors in proportion to the amount of the capital paid up by them.

The *Exmouth and District Water Act* confers further powers as to capital and otherwise upon the Exmouth and Budleigh Salterton Water-Works Company. The Company were incorporated in 1864 with a capital of £8000, and power to borrow on mortgage £2000. The Company have constructed works in addition to and in substitution of portions of the works authorized by their Act of 1864, and have exceeded the capital powers then conferred, the sum of £2800 having been borrowed on the responsibility of the Directors. The district of the Company is revised by the present Act, to the exclusion of the district of the Budleigh Salterton Local Board, and the name of the Company is also altered. Certain works previously unauthorized are included in the Act, and power is also given to the Company to make certain extensions to be completed within five years. The Company are authorized to raise £20,000 additional capital, with which is included the £2800 borrowed by the Directors; dividends on this latter amount are to be limited to five per cent., and to seven per cent. on the remainder of the new capital, or five per cent. if issued as preference capital. The Company may also borrow on mortgage £5000. The Company take powers to sell or let meters, and to supply water and sanitary fittings to their customers; and also to sell water in bulk if they can spare a sufficient quantity from their ordinary domestic supply.

The *Great Yarmouth Water-Works Act* extends the limits of the Great Yarmouth Water-Works Company, and authorizes the Company to construct additional works, and to raise further capital. The Company were incorporated in 1853, and they have since been twice in Parliament, in 1857 and 1869, whereby their capital was fixed at £120,000 in shares and £26,000 on loan, of which £104,800 and £21,000 have been raised and borrowed respectively. The limits of supply are now extended to include parts of three parishes, the rates for water in which are not to be more than one-fourth higher than those charged within the former limits. The Company are empowered to raise £80,000 of additional seven per cent. capital, and to borrow £20,000 in respect thereof. The Company take power to make an additional line of pipes on certain lands, and passing under the River Bure, under several restrictions for the protection of navigation, &c.; the works to be completed in seven years. Clauses are inserted for the protection of the Crown property in the foreshore and Crown lands.

The *Wrexham Water-Works Act* enables the Wrexham Water-Works Company to make new service reservoirs and filter-beds, to extend their limits of supply, and to raise additional capital. The Company were incorporated in 1864, with a capital of £15,000 in shares and £3750 borrowed, with permission to raise, if necessary, a further sum of £6000 by shares and £1000 by borrowing. Again, in 1874, the Company were authorized to raise £20,000 in shares and to borrow £5000. All these sums have been raised and expended. By the present Act the Company's limits are extended to include a number of townships in the counties of Flint and Chester, and the Company may also open roads and lay pipes in the limits of the Brymbo Water Act, but not supply water therein. The Company are empowered to raise £60,000 additional seven per cent. capital, and to borrow £15,000. They may construct certain service reservoirs and filter-beds within ten years, and may acquire five

acres of land additional to their compulsory powers with respect to sites of their new works. The Company take power to supply fittings and to furnish water in bulk, if this can be done without interference with their domestic supply. The time fixed in the Act of 1874 for the completion of certain works is extended to ten years from June 30, 1880. A clause is inserted for the protection of the London and North-Western and Great Western Railway Companies.

In only one instance did a public authority seek for legislative sanction for the acquisition of a water undertaking during the past sessions:—

The *Rochester City Improvement Act* authorizes the transfer of the undertaking of the Strood Water-Works Company to the Corporation of Rochester in consideration of the sum of £6500, together with the costs of the Company, as agreed on, amounting to £350. The Corporation take powers to construct an additional reservoir and lines of pipes for the better supply of their district, to be completed within seven years, at an estimated cost of £4000. Water-rates are to be levied at different amounts, with direct reference to the rateable value of the property supplied, up to a rental of £40 per annum, beyond which the rate is fixed at five per cent., with the usual extras. The supply is not bound to be constant, unless so required by the Local Government Board. The Corporation likewise take power to supply water by agreement.

(To be continued.)

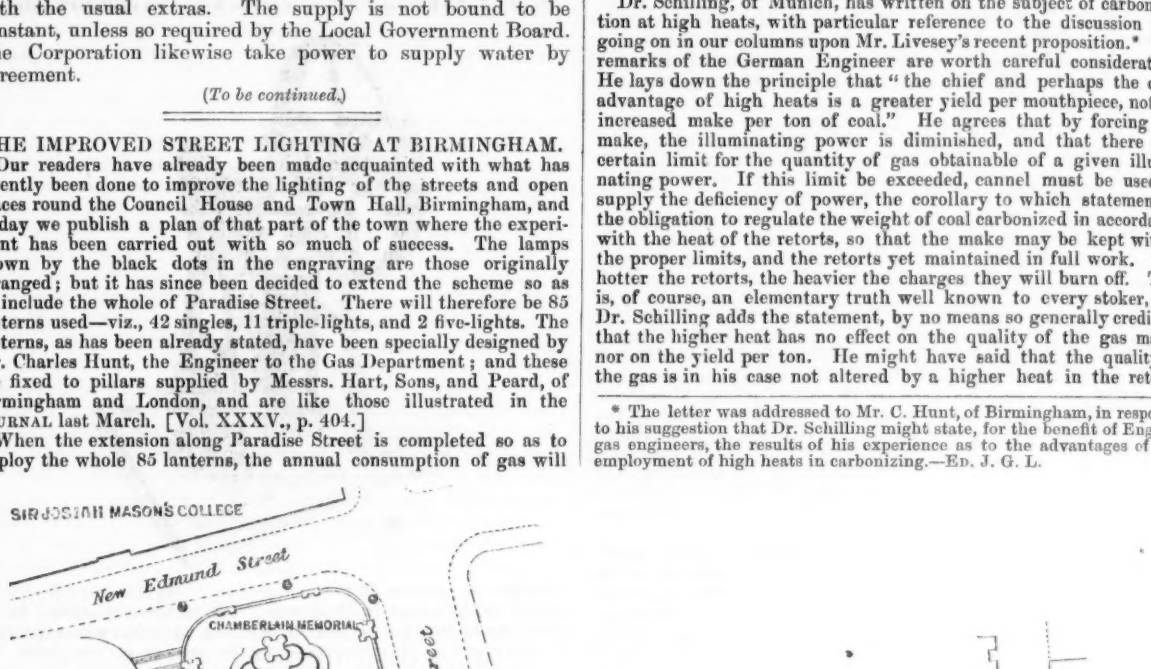
THE IMPROVED STREET LIGHTING AT BIRMINGHAM.

Our readers have already been made acquainted with what has recently been done to improve the lighting of the streets and open places round the Council House and Town Hall, Birmingham, and to-day we publish a plan of that part of the town where the experiment has been carried out with so much of success. The lamps shown by the black dots in the engraving are those originally arranged; but it has since been decided to extend the scheme so as to include the whole of Paradise Street. There will therefore be 85 lanterns used—viz., 42 singles, 11 triple-lights, and 2 five-lights. The lanterns, as has been already stated, have been specially designed by Mr. Charles Hunt, the Engineer to the Gas Department; and these are fixed to pillars supplied by Messrs. Hart, Sons, and Peard, of Birmingham and London, and are like those illustrated in the JOURNAL last March. [Vol. XXXV., p. 404.]

When the extension along Paradise Street is completed so as to employ the whole 85 lanterns, the annual consumption of gas will be 6,376,000 cubic feet, as against 1,073,500 feet consumed in the 37 lanterns of the old type, burning from 5 to 10 feet per hour, which have been removed. The new lamps are now lighted up at dusk, and burn 30 feet of gas per hour until 11 p.m., or to a later hour if there is any meeting at the Town Hall or Council House which is not closed at that time. Afterwards, until the ordinary street-lamps are turned out in the morning, the consumption of gas is reduced to 10 feet per hour; while during the day a flash light is kept burning about a ½-foot of gas each hour.

As to the cost of repairs under the new arrangement, of course there has not yet been any experience in this direction; but it is not believed it will exceed the cost of repairs to the ordinary lanterns. The cost of cleaning, lighting, and extinguishing will necessarily be a little more than for the ordinary lamps, inasmuch as the men have to attend three times in place of twice to light and extinguish.

The illumination of the surrounding buildings, even to their summits, is a very noticeable feature in the improvements here referred to, the lanterns having very narrow ribs, and being made of clear glass throughout, except a small portion at the top, slightly larger than the corona. This is formed of opal glass, and serves to diffuse sufficient of the light, but not an undue proportion of it, to the base of the lamp-pillar.



GERMAN VIEWS ON CARBONIZATION.

Dr. Schilling, of Munich, has written on the subject of carbonization at high heats, with particular reference to the discussion still going on in our columns upon Mr. Livesey's recent proposition.* The remarks of the German Engineer are worth careful consideration. He lays down the principle that "the chief and perhaps the only advantage of high heats is a greater yield per mouthpiece, not an increased make per ton of coal." He agrees that by forcing the make, the illuminating power is diminished, and that there is a certain limit for the quantity of gas obtainable of a given illuminating power. If this limit be exceeded, cannel must be used to supply the deficiency of power, the corollary to which statement is the obligation to regulate the weight of coal carbonized in accordance with the heat of the retorts, so that the make may be kept within the proper limits, and the retorts yet maintained in full work. The hotter the retorts, the heavier the charges they will burn off. This is, of course, an elementary truth well known to every stoker, but Dr. Schilling adds the statement, by no means so generally credited, that the higher heat has no effect on the quality of the gas made, nor on the yield per ton. He might have said that the quality of the gas is in his case not altered by a higher heat in the retorts

* The letter was addressed to Mr. C. Hunt, of Birmingham, in response to his suggestion that Dr. Schilling might state, for the benefit of English gas engineers, the results of his experience as to the advantages of the employment of high heats in carbonizing.—ED. J. G. L.

because the yield per ton is unaltered. Dr. Schilling states that at one time he used to obtain in 24 hours between 5000 and 6000 feet of gas per mouthpiece, whereas he now gets 8500 to 9000 feet without alteration in quality or rate of production, but simply by charging more heavily. He, in fact, has endeavoured to obtain a yield of 10,000 feet per mouthpiece in 24 hours, but he then fell into difficulties with his tar, which became practically pitch at the increased temperature. In consequence of the quickly carbonizing qualities of the Saarbruck coal, such as is principally used in Munich, and is said to excel Newcastle coal in this respect, Dr. Schilling has four-hour charges, having tried lighter three-hour charges without success; and he has no difficulty in making 9000 feet of gas per mouthpiece, although his tar is said to contain less light naphtha now than formerly. Nevertheless, he sells it as well as ever, and has no trouble with the naphthaline now present in the gas in somewhat greater quantity than before, having merely to exercise rather more care in condensation. Dr. Schilling is unable to give a scientific explanation of the changes due to high heats in the process of carbonization, as he confesses that the operation is very complicated, and that little is known about it.

So far Dr. Schilling is dealing with general principles. It is something to be informed, on such high authority, that as good gas may be made at extreme heats as when retorts are moderately worked, provided that proper precautions are taken, by loading the retorts heavily, to avoid excessive carbonization. But this only removes one of the extraneous doubts which might arise as to the wisdom of adopting high *versus* moderate heats. Inside of this question comes the other principle laid down by Dr. Schilling—that only a certain quantity of gas of a given illuminating power can be made from a specified coal, beyond which quantity the entire bulk of the gas becomes deteriorated. Gas engineers have long known that the last portions of a charge of coal give off a very inferior gas, and Mr. Livesey has perhaps done no more than connected the last portions of the charge, in a striking manner, with the higher figures of the yield per ton. But as this relation does not appear to be yet universally recognized, he has done well in attempting to bring the subject to a logical issue. He will have done better when he has completed his promised experiments with the object of confirming the deductions of logical reasoning by the evidences of observed facts. Argument will take us far towards the truth in this matter, for, reduced to its elements, the question may be put in this way: Granted that the last portions of a charge are bad, where should distillation stop to secure the best average results? This can only be settled by experiment with every kind of coal, in which all the derivatives of the coal will receive due consideration, and then the results of each investigation must be held to apply to the particular coal treated, and to no other. If the result of the present discussion should prove to be the establishment of a rational rule for carbonization, which, without reference to a fanciful standard of high and low production, shall depend simply upon making the absolute best in every way of the material put into the retorts, it will have conferred great benefit upon the profession and also upon the general community.

Returning to Dr. Schilling, after mentioning the aforesaid fundamental principles, he goes into particulars with reference to the means he employs for obtaining the high heats so much in favour with him. It is needless to say more than that Dr. Schilling's furnaces are worked on the regenerative system of gas firing. During the past summer and early autumn he used only 26·5 lbs. of fuel to produce each 1000 cubic feet of gas, or 14·04 lbs. of coke per hundredweight of coal carbonized, with an average production in 24 hours of 8620 cubic feet of gas per mouthpiece. In 1878, on the old system of grate furnaces, Dr. Schilling used 21·8 lbs. of coke per hundredweight of coal carbonized, making only 6216 cubic feet per mouthpiece in 24 hours.

Dr. Schilling concludes by stating that, in his opinion and experience, high heats, corresponding with a production of 8500 to 9000 cubic feet of gas per mouthpiece in 24 hours, such heats being derived from generator furnaces, will, in England as in Germany, be found to offer the best and most economical means for the production of good coal gas. And in this opinion we are disposed to concur, with the further qualification that such heats must be intelligently applied and carefully managed.

Notes.

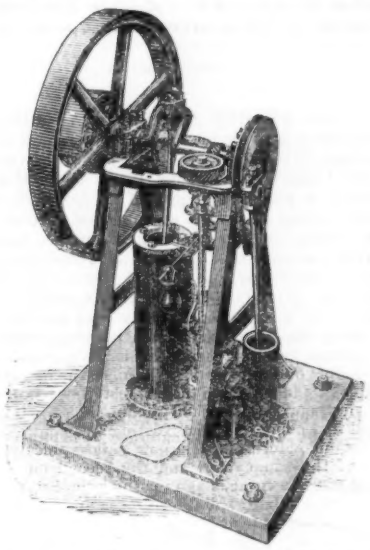
[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

A Novel Retort-Charging Machine.

Mr. George Rooke, of the Corporation Gas-Works, Nottingham, has invented an apparatus—called by him "The Breech Loader"—for charging retorts, and registering the charge at the same time. A moveable hopper, supposed to be kept full of broken coal, terminates in a vertical barrel which has three chambers in it somewhat similar to the chambers in a revolver-breech, each chamber containing a charge of coal. The hopper and barrel are, of course, above the path of the scoop. When the scoop is to be filled it is brought to an inclined position with reference to the loading barrel, the point being lowered. One turn of a vertical shaft releases a charge of coal, which falls on an intermediate shoot, and is thereby directed to the rear of the scoop. The breech-end of the scoop is made tubular, and carries round it a cog-wheel rim. As the point of the scoop is depressed while being loaded, the contents would fall out, but for a cover which at such times is laid over the top of it. When the scoop is full, and registered by the requisite mechanism, it is instantly brought to a horizontal position by lowering the breech, or raising the point, as the case may be, and the temporary lid being thrown back, it is wound into the retort by suitable gearing, being carried in a guide frame. When the scoop is entered to its full length, the cog-wheel rim before mentioned is turned by a pinion with which it is then geared, consequently reversing the scoop and charging the retort. The scoop is withdrawn by the reversal of the winding motion that drives it forward. The arrangement works well in the model, but it has not yet been tried on the manufacturing scale. It will have to be shown that the advantages of loading the scoop in the manner indicated are such as to compensate for the necessity of providing and working a moveable cover. It does not appear, moreover, that the inventor contemplates the use of power for his apparatus, and it remains to be proved that the labour of effecting the necessary motions is within the capabilities of manual labour. The apparatus is remarkably compact and simple in appearance, and as far as may be judged should be easily kept in order.

A New Gas-Engine.

Messrs. S. Clayton and Co., of Bradford, have recently patented a gas-engine of improved construction. The engine, as will be seen from the accompanying figure, is made with two cylinders, into one



of which a mixture of air and gas in a regulated proportion is drawn by the ascent of the piston. The mixture is driven by the down stroke into the second, or working cylinder, where, previous to being ignited, it is compressed by the descent of the piston. It is claimed that by this double process of compression the charge is very intimately mixed. The chief peculiarity in the engine is, however, the plan adopted to regulate the admission of the charge, in place of the usual slide-valve, which is replaced by a simple arrangement said to possess certain advantages. It is stated by the inventors that the slide-valve is a constant source of trouble, even in the best-constructed gas-engines fitted with it, on account of the difficulties attending its lubrication, excessive wear, and the loss of power caused by it. This loss is said to amount to upwards of 30 per cent. of the power actually developed by the engine. In this new engine a small portion of the charge is allowed to pass a regulating screw into a chamber, where it is ignited by a little external flame, when it is trapped in the chamber by the descent of an ordinary mushroom valve, and is afterwards passed into the working cylinder with the charge. The charge being thus fired, exerts its expansive power in the usual way upon the working piston. This arrangement is stated to require very little attention, and from the extreme simplicity of its working parts, to be almost free from risk of getting out of order. Messrs. Clayton and Co. had an engine of this class working at the recent Blackburn Exhibition of Gas Apparatus, where it appears to have met with much favour. The invention has been so recently completed that there are as yet no available *data* as to its performance in comparison with other forms of gas motors. The patentees claim to be able to get a superior duty from it, mainly on account of its liberating for actual work the power in other cases absorbed by the action of the slide-valve. Although shown as a vertical engine, the same principle may be applied to horizontal engines.

Steam Domes on Boilers.

In a communication published in the current number of the *Journal of the Franklin Institute*, Mr. W. Barnet Le Van treats of the weakening of steam boilers by cutting holes in the shell for domes and manholes. The author refers to a commonly received notion that the shell is weakened only in proportion to the size of the hole cut, and emphasizes the fallacy of this belief. When steam domes are specified for boilers, it is commonly provided that the space covered by the dome shall not be entirely cut away, but that holes are to be

pierced through the continuous plate, with the idea that by the latter procedure the weakening effect of the dome is materially lessened. The proper way of regarding the action of the dome is demonstrated by Mr. Le Van to be that of an appliance for subjecting so much of the shell as it covers to a compressive strain from without, equalling the tensile force acting from within. The result being that the portion of the shell so treated is deprived of its direct-acting tensile strength, which would otherwise be exerted in resisting an enlargement of the circle of the boiler, and has to exercise, in substitution of this action, the resistance made by a curved plate pulled in the direction of its chord. This transformation of duty is very evident on looking at the conditions of the case; there is nothing to keep the arch of the plate up when there is an equal pressure on both its outside and inside as under a steam dome, while the pressure of the steam exerted on the other portions of the ring tends to pull this particular arc of the circle into a straight line. To obviate this serious defect in the application of steam domes, whenever they are insisted on they should be connected to the boiler shell by a neck only, of much less diameter than the body of the dome. But Mr. Le Van disputes their utility *in toto*. He would take the steam from the boiler, in as dry a state as can be secured by the interposition of a dome, merely by a horizontal pipe carried along inside the boiler above the water, and perforated on its upper surface with a sufficient number of holes to correspond in area with that of the steam-pipe. By this means, similar to the device adopted in the construction of locomotive boilers, and also by ensuring in all cases that the steam-pipe between the boiler and the engine shall have a capacity exceeding that of the cylinder, the author of the paper states that steam domes may be safely dispensed with, not only without detriment to the dryness of the steam, but with positive benefit thereto, as also with advantage to the strength of the boiler.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

DR. ADAMS'S GAS STOVES.

SIR,—In the last number of the JOURNAL, your correspondent, Mr. Denny Lane, writes as follows:—"The report of Dr. Adams and Mr. J. L. Bruce states that 51,300 of these new units of heat were utilized per cubic foot of gas." As I am the only person of the latter name who has (so far as I am aware) either tested or written about these stoves, it appears likely that I am the J. L. Bruce referred to. If this is the case, your correspondent must be under some misapprehension, as I have never made any joint report with Dr. Adams on his stoves, and indeed have never tested them, except on two occasions, the first, on an unfinished model in May, 1879, the results being published in a paper on "The Heating and Ventilation of Turkish Baths," read by me before the Glasgow Philosophical Society on the 30th of April of the same year; and the second on the stove in its finished form, made a few weeks ago for the adjudication on the heating stoves shown at the late exhibition of gas apparatus, &c., in Glasgow, and the result of which has not yet been made public. Your correspondent's misapprehension on this point is the more unfortunate, because I do *not* agree with Dr. Adams's new method of estimating units of heat, and wrote several letters to the late *Journal of Artificial Light*, proving them to be incorrect under certain circumstances. These letters and the Doctor's replies will be found in the issues of that *Journal* for March 27 and April 3 and 10, 1880. In the first of those numbers your correspondent will also find a calculation based on the Doctor's own figures, obtained, as I understand, from his own tests, showing that according to them his stove developed a heating power of 1314 units per cubic foot of gas—a result which I characterize as "most astonishing."

Whether this power is possible or not, it is impossible to say, because, unfortunately, we have no complete analysis of our Glasgow gas, and so cannot calculate what the ultimate theoretical heat power actually is. Your correspondent, however, is under the mark in stating the thermal units in cannel gas at 700 per foot, as I myself have observed 850—a result which has since been so far confirmed by some tests made by our Gas Examiner, Dr. Wallace, in November of last year, which show, in a comparative form, the heating power of gas of various illuminating qualities.

With regard to your correspondent's remarks as to the merits and demerits of the Adams stove, I can, of course, in the meantime, say nothing, except perhaps to point out that he takes the specific heat of air as 0·237, whereas Regnault gives it as 0·2380, which I think is the usually accepted figure.

With regard to Dr. Siemens's stove, it seems to be another success, like most of Dr. Siemens's inventions; at the same time, it can hardly be called a gas stove, being neither free from ashes nor permanent, in the sense of practically requiring no attendance for the renewal of the fuel employed, as is the case with the ordinary gas stove so called.

I trust your correspondent's letter will bring out further information on the ultimate calorific power of coal gas of various qualities, as at present there is but little really practical information on the subject.

103, *West Regent Street, Glasgow, Nov.* 27, 1880. JOHN L. BRUCE.

[We are asked to state that Dr. Adams's reply to Mr. Denny Lane's letter, referred to in the above communication, will appear next week, being too late for insertion to-day.—ED. J. G. L.]

UTILIZING THE WASTE HEAT FROM RETORT SETTINGS.—We have received a long letter from Mr. Alfred Upward, in reference to the paper read by Mr. Jolliffe before the North of England Gas Managers Association last month, and calling attention to the fact that many years since he carried out a similar idea when Engineer of the Chartered Gas Company at their Curtain Road station. What he did in this respect was alluded to in a paper "On Setting and Working Retorts" read before the British Association of Gas Managers in 1870, and published in the JOURNAL, Vol. XIX., p. 485. Mr. Upward says that in 1850, when Engineer of the Curtain Road Gas-Works, he employed the waste heat from the retort flues for producing steam to work all the machinery then in use, which consisted of an apparatus for pumping clean gas from the Brick Lane station into the gasholders at the Curtain Road station, working the machinery for turning the wet lime purifiers, and pumping tar and liquor. A short period after this date it was resolved to substitute clay for iron retorts; and this alteration necessitated the use of exhausting apparatus. About the same period the Company further resolved to construct their own water-works. A well between 400 and 500 feet in depth was therefore formed in order to obtain a good and pure supply of water. This well was a perfect success, and supplied the works by means of three 7-inch pumps placed close to the surface of the water, and at a considerable depth below the yard. The then existing machinery was replaced with new plant, consisting of one of Mr. Beale's exhausters, three steam-engines, and two boilers, which were supplied with waste heat from three sets of five retorts. One of these engines was used for working the exhausting apparatus, and other machinery in connection with the wet lime purifiers, &c. The quantity of gas pumped per day was between 500,000 and 600,000 cubic feet, against a pressure of over 24 inches of water. A second engine was employed for working the three 7-inch pumps to supply the works with water, causing a saving of nearly £400 per annum, which sum was formerly paid for water. The third engine was kept in readiness to provide for any emergency. Thus the whole of the steam machinery at the Curtain Road station in those days was driven by steam produced by waste heat from the retorts. In 1852 the Directors appointed Mr. Upward to the double office of Engineer to the Brick Lane and Curtain Road stations, and having proved the success of his plan, he was enabled to induce them to carry out the same process at their Brick Lane station on a much more extended scale. In this case steam was required to supply three engines—namely, two 20-horse and one 10-horse; and a new apparatus, so far as the steam-boilers were concerned, was ordered to be erected. These engines were most satisfactorily supplied with steam produced by the waste heat, and were all worked together during the four winter months of each year, exhausting the whole of the gas produced at the Brick Lane station, pumping water from a deep well to supply the works, and working the tar and liquor pumps. The maximum quantity of gas pumped in this case was about 2 million cubic feet per day against a pressure of over 20 inches of water. As the process was found so successful at these large works, Mr. Upward resolved to try what could be done by employing it at smaller gas-works, where he was Consulting Engineer, and where the number of retorts employed was very limited. He has there carried out the plan with perfect success, and has proved beyond all doubt that, with a properly constructed apparatus, all the exhausting and other apparatus can be worked by steam produced by the waste heat from one bed of five retorts; thus showing that small gas companies may avail themselves of a proportionate saving by using the method which produced such good results in the large works named. For more than 25 years past Mr. Upward has caried out this plan on works designed by him at home and abroad, with the addition of producing sufficient steam for working up the products as well as that required for working the machinery of the gas establishment. He is at present erecting, for the Oldbury Local Board of Health, new gas-works of more than 50 million cubic feet per annum capacity, where sufficient provision will not only be made to exhaust the gas, and pump water, tar, and liquor, but also to manufacture the products, and to drive all the machinery required on the works, and this with only a limited portion of the waste heat produced from the retorts. In some of the instances in which this plan of generating steam has been applied, the furnaces have been placed at a considerable distance from the boilers, and in other cases the steam has been carried a great distance to the engines. This fact points to the possibility of disposing of the waste heat produced at gas-works to adjoining establishments, or selling the steam thus produced for driving machinery. In the course of his communication, Mr. Upward says: "I do not write this letter with any antagonistic feeling, but that, as I was undoubtedly the first to carry out with perfect success the plan of utilizing the waste heat for producing steam to work the machinery of large and small gas-works, it is only fair that I should have the credit of that which belongs to me. The waste of fuel and the economization of heat having become very important questions of the day, I hope that my plans for preventing waste, which have been so successfully carried out, may prove of some value to the public, and especially to gas companies, whose consumption of coal is so enormous."

THE USE OF OXIDE OF IRON IN GAS PURIFICATION.—Mr. J. Hall, of St. Andrews, N.B., sends us some interesting figures—which have been forwarded to him by Mr. T. D. Hall, the Superintendent of the Brompton works of the South Australian Gas Company—showing the saving effected by using oxide of iron in conjunction with lime for gas purification, in preference to the latter only. These show the following results:—

Lime used from May 1, 1877, to Aug. 31, 1878		16,900 bushels.
Do. May 1, 1879, to Aug. 31, 1880		4,590 ,,
Saving effected		12,310 bushels.
Number of purifiers charged during first period		143
Do. do. do. second period		58
Saving effected		85
Gas made during first period		125,536,200 cubic feet.
Do. second period		143,265,500 ,,
Increase in second period		17,729,300 cubic feet.
Gas purified per bushel of lime during first period, with lime alone		7,428 cubic feet.
Do., do., during second period, with lime and oxide		31,212 ,,
Lime that would be required to purify gas made during second period at the above average—viz., 7428 cubic feet per bushel		19,287 bushels.
Actual quantity used		4,590 ,,
Total lime saved		14,697 bushels.
14,697 bushels of lime, at 10d.	£612 7 6	
Less 36 tons of oxide	£126 2 7	
Freight, &c.	51 12 5	
	177 15 0	
	£434 12 6	
Filling 85 purifiers, at £1 6s. 8d.	113 6 8	
Total saving	£547 19 2	
Average quantity of gas purified per bushel of lime (with oxide) for 16 months		31,212 cubic feet.
Average quantity of gas purified per bushel of lime for last three months		41,250 ,,

NOTE.—The oxide had been in use for 16 months up to Aug. 31, 1880, and had purified 143,265,500 cubic feet of gas.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, Nov. 12.

(*Before Justice* FRY.)

SLACK *v.* THE MIDLAND RAILWAY COMPANY.

This was an action to recover damages for the alleged wrongful acts of the defendants in pouring gas tar and other residual products of their gas-works at Chesterfield into the River Hipper, which is a small stream running through part of the plaintiffs premises, and from which they obtain the supply of water necessary for carrying on their business. The plaintiffs, William Slack and Sons, Limited, carry on the business of fellmongers, tanners, leather manufacturers, neatsfoot oil and glue manufacturers, and other business of a kindred nature, at their works called the Hipper Leather Works, situated at Chesterfield. The Company were incorporated in September, 1878, and took over the business of Messrs. William Slack and Sons, which it was stated was a very prosperous concern, and had existed for more than 100 years. The Midland Railway Company some few years ago acquired a piece of land formerly used as a tanyard, and which was near the plaintiffs works. Upon a portion of this land they erected gas-works, and the tar and other refuse was conveyed, according to the plaintiffs case, through intersecting drains into the water of the Hipper, causing a serious interference with the plaintiffs manufactures, and greatly depreciating the value of their goods.

Mr. ASTON, Q.C., Mr. FORD NORTH, Q.C., and Mr. LEONARD FIELD appeared for the plaintiffs; Mr. HORACE DAVEY, Q.C., and Mr. PHIPSON BEALE for the defendants.

After the opening speech of Counsel for the plaintiffs, evidence was adduced on their behalf.

Mr. *Samuel Slack*, Managing Director of the plaintiff Company, gave a detailed account of the treatment the skins underwent from the time that they entered their establishment till they had been finally prepared for sale. He said that the water for all the processes must be good, for the reason that foul water would stain the skins. Skins could not be made white by dyeing, but cream-coloured ones could be made into blue, red, or any other colour. The most valuable skins, therefore, were the creams. If foul water were used the skins would come out a dull colour, and would not be creams. Creams were worth at the present time from 30s. to 40s. a dozen, but if the process of manufacture were not successful, and the skins turned out to be of inferior quality, there would be a difference in value of 15s. a dozen. He had seen tar issuing from drains connecting defendants works with the river, and the presence of tar in the water used at their (the plaintiffs) works was shown by dark stains on the finished leather. The plaintiffs had had to send skins away to be dressed in consequence of the presence of gas-works refuse in the Hipper water, and this had involved a considerable loss of profit. They had also lost materially by damage to white horse hides and other white leather. The wools, too, both English and foreign, were stained by the tar, and the sale value thereby injured. Wool after being cleaned was subjected, in the process of drying, to a heat of 180°, and the effect of this was, when tar was present, to melt the tar, and cause it to run and to spread through the mass.

In cross-examination, witness said the gas-works were upon land that formerly belonged to a Mr. Hopkinson. A Mr. Mills had at one time a tanyard adjoining the mill dam, and he used to take his water from the dam. Mr. Mills gave up in 1873, and Messrs. William Slack and Sons then became tenants of the premises he occupied. The Midland Railway Company began to manufacture gas at Chesterfield in September, 1877. The dam was cleaned out about once a year, and he had been present at the cleaning, but had never previously to 1877 seen a deposit of tar in the bed, and had never had complaints made to him by workmen in his employ about the work being spoilt by tar. He had never heard of such complaints having been made at any time by workmen in the employ either of Mr. Mills or Mr. Hopkinson. He was not aware that Mr. Hopkinson caused a well to be sunk in order that he might get a supply of pure water for the cleansing of his skins. Whole skins were drawn through the goit, and then spread on flat stones on the bank, but he had never heard of deposits of tar being found on the stones. During the spring and early summer of 1879 there were very heavy floods, the Hipper was flooded to a very considerable extent, and the bed of the river was washed up. He was present when the weir was repaired, but saw no tar in the river on that occasion. He had never seen tar in the water higher up than the weir, and, except in the goit and dam, he never saw any deposits of tar in the river. He went up the river after the flood had subsided, but did not discover any trace of tar. He had a dozen times seen tar coming down into the goit from the outlets connected with the gas-works.

SATURDAY, Nov. 13.

Mr. *S. Slack* was recalled, and re-examined as to the injury alleged to have been caused by the tar.

Mr. *A. H. Allan*, Professor of Chemistry at the Sheffield School of Chemistry, said he visited plaintiffs works on the 13th of May last year. He saw the process of treating skins and the water used. There was evidence of tar in all the tanks. He went into the store-house and found many of the skins discoloured. He visited the dam, and the water was run off, when he found a large deposit of mud in the mill dam mixed with tar. Above the shuttle he saw films of tar floating down the river at that place. He preserved a specimen of the water with the tar. He went higher up, and opposite the second outlet of the plaintiff's works he saw tar issuing in larger quantities up to the top of the water. The specific gravity of tar was slightly heavier than that of water. One of the workmen put a piece of wood across the goit to dam up the tar, and he noticed that the tar increased in quantity. He analyzed the specimens of the mud and water he took, and found tar in them. The mud taken from the bed of the river was very tarry indeed. He visited the plaintiffs works again on the 22nd of May, when he saw very much the same as on his first visit, except that there was no flow of tar from the second outlet. He took samples on his second visit both of the mud and the water from various parts of the river. He found the worst mud he discovered in Messrs. Slack and Sons dam contained 5 per cent. of tar. In the mud from the goit above the dam-head opposite the first outlet he found 15 per cent. of tar. The worst mud from the silk mill-dam and the broken weir contained no tar whatever. He had made some experiments on foreign wool with tar in order to ascertain the effect of tar upon it. He found that the more tar there was in the water the more the value of the wool was decreased, and the wool discoloured. The effect of tar mixed with water was very deleterious to wool and skins. He analyzed some discoloured scraps of skins which he took from the plaintiffs works, and he found tar upon all of them.

Mr. *William Slack*, Manager of the plaintiffs works, said in November, 1878, he found that a large quantity of tar was floating into their dam from the defendant Company's works. He sent a messenger to the defendants works, and their foreman came to him and said he would prevent it in the future. However, he frequently saw tar running down the dyke into the goit. The goit supplied two wool-washing pits. During the autumn of 1878 and the spring of 1879 he frequently found tar in the wool-washing pits. The effect of this was that all the goods in the pits were stained, and considerable damage was caused in consequence. The tar also had a great effect on the grease which they sold after it had been used in their processes, and lessened its value by £6 or £7 a ton. He complained to the defendants servants of the injury done by the tar on many occasions, and although promises were made to put a stop to the nuisance, it still continued. The plaintiffs dam was cleared out once a year by the force of water. The dam, however, had not been cleared out since 1877. Before 1878 there had never been any trouble from pollution of the river.

Cross-examined: He never saw skins discoloured in a similar way with tar before 1878. He had never tried to remove the tar from the skins.

George Lawson, leather dresser in the plaintiffs employ, said he first noticed injuries to the skins in 1878. The skins were stained and spotted in a manner which he had not seen before. He did not at first know the cause of the stains; but he afterwards examined the water, and found tar in the vats and tubs in the shops. He also found tar in the well that supplied the shop and goit, and also found it sticking on the skins when they were dry. In consequence of the tar spoiling them the plaintiffs had to give up tanning "skivers" in March, 1879. After he discovered tar in the tank he examined the river, and saw tar oozing out of the defendants drain.

Cross-examined: He had seen tar on the bank of the goit. He had never examined the river above the dyke. The plaintiffs left off making skivers from March, 1879, until the middle of the present year. The foreign skin and the wool trade were continued all along. He had seen tar at the bottom of the goit just at the mouth of the pipes.

Mr. *William Henry Howard*, a Surveyor, stated that he inspected the works of the plaintiff Company on the 20th of May last year, and found the water in the works very much discoloured and covered with films. He found that the discolouration arose from matter which came from the defendant Company's works.

MONDAY, Nov. 15.

Mr. *E. F. Cheater*, an Analytical Chemist, of Chesterfield, said he had known the plaintiff Company's works for the last eleven years. He visited the works on May 31, 1879, and, inspecting the washing goits, saw upon the surface of the water patches or films of tar. The store tank was covered to the extent of one-third with the films. He saw the dam, and scooped up some of the mud, which was entirely charged with tar. He went up the stream, and in the dyke opposite the defendant Company's works he found more tar than at any other place. He went up the Hipper a considerable distance above defendant Company's works, but failed to discover the presence of tar at any place above there. He took a sample of the mud from the dam, and found it contained 4½ per cent. of tar when he analyzed it. He also took a sample of the water with the films upon it, and upon analysis found the films were caused by the presence of tar. He went over the plaintiff Company's works for the purpose of ascertaining the damage done to the wool and skins, and also made experiments with tar upon grease. He found that tar greatly discoloured the grease, and deteriorated the value of it. The tar was also highly injurious to both the wool and the skins.

Maurice Greenwood, one of the morocco leather dressers in the plaintiffs employ, said he had noticed impurities in the water since the erection of the defendant Company's gas-works. Up to the time their gas-works were established he had never noticed anything in the water; but since they had been he had frequently found the skins stained in consequence of using the water. He had seen oily black matter floating in the water opposite the weir. He produced a book in which he had entered at the time the dates on which he had seen the tar floating on the water.

Mr. *C. E. Jones*, Manager of the Chesterfield Gas Company, next gave evidence. He said he had visited the tanks and found tar there. In the dam and the goit, by agitating the water at the bottom, unmistakeable signs of tar were apparent. He also saw tar clinging to the masonry at the dam. He tasted the water, and by taste and smell satisfied himself that the impurities were produced by coal tar. He endeavoured to ascertain where the tar came from, and found that the principal place was an outlet near the defendant Company's gasholder. He found no tar above this outlet. He made a second inspection on the day following his previous visit, and took a sample of water from the mouth of the outlet from defendant Company's works. He subjected a portion of the sample to distillation, and produced some pitch [produced] from the process. The result of his analysis enabled him to say that there was a large quantity of tar in the mud and water. At the weir opposite White Horse Yard he found a film or bar of tar, which was quite insignificant, and he found no tar at any other place above the defendant Company's works.

Cross-examined: There was no truth in the statement of the Medical Officer of Health that the Lime Cure Brook, which ran into the Holm Brook, was contaminated with lime and coal tar from the Chesterfield Gas-Works, which would be sufficient in itself to pollute the stream. The Doctor was challenged to summon the Company, but declined to do so. The Chesterfield Gas Company made sulphate of ammonia from their liquor. The liquor was never turned into the Holm Brook after the salt was made. Tar occasionally got into the boilers used in the process. He was not aware that coal tar and ammoniacal liquor ran into Holm Brook on the nights of the 12th, 13th, and 14th of May, 1879. He never gave instructions that it should be run off into the brook at night in small quantities, so that it should not be seen. He remembered on one occasion one of the workmen informing him that tar was found in a drain, when he had the drain dammed up, and, on investigation, found that tar had been put in the drain by design, and had not escaped from the works.

Dr. *Bluett*, Medical Officer of Health for Chesterfield, said he inspected the plaintiffs works, and saw tar oozing out from between a stone wall on the defendants premises into the river.

Cross-examined: The tar he had seen oozing through the loose wall was not diluted with water, but was pure tar.

Mr. *George C. Trewby*, Chief Engineer of the Beckton Gas-Works, gave evidence to having inspected the plaintiffs works, and taken samples of the mud in the river [produced]. One sample contained 3·65 per cent. of tar. He said he was perfectly convinced that the only source from which tar had got into the plaintiffs works was from the defendants premises. He had examined the Chesterfield Gas-Works, and could not find any outlet whereby tar might find its way from those works into the river.

Cross-examined: If tar had come down the river at all, he should have expected to find indications of it in the intervening water, which was not the case.

Justice FRY remarked that he did not wish to prejudice the case, but if Dr. Bluett's evidence was to be relied on, he had seen tar oozing from the defendants premises.

Mr. DAVEY admitted that he was surprised to hear Dr. Bluett's evidence; but his instructions were that tar had been accumulating in the river for years, and was there when the defendants commenced to construct their gas-works.

Evidence was then adduced as to the construction of the Chesterfield drainage works.

TUESDAY, Nov. 16.

Mr. *Thomas Ward*, Architect and Surveyor of Chesterfield, said he had been acquainted with the plaintiffs works and the River Hipper all his life. In June of the present year a cutting was made through the Holm Brook in connection with the main sewerage works of the town of Chesterfield, when gas tar and refuse appeared in layers below the bed of the stream. Those layers were about 2 or 3 feet below the bed of the stream. The cutting was made through the brook at the Old Forge Works. The Gas Company gave up the Old Forge Works in 1856.

Cross-examined: The soil above the layers of tar was of a light sandy character. He had never seen any traces of tar in the stream at that place before the cutting was made.

John Higginbottom, foreman of the stokers and engine tenters in the employ of the Chesterfield Gas Company, said in 1879 Mr. Jones gave him instructions that nothing was to be sent down the drain in connection with the new works. No tar was ever discharged from the gas-works into that drain.

Mr. *R. T. Gratton*, Chairman of the Chesterfield Water and Gas Company, said in February, 1879, he had an interview with Mr. Waterfield, who was connected with the defendant Company's gas-works. He asked Mr. Waterfield why he allowed tar, which was a valuable product, to be wasted, and that gentleman told him that the Midland Company had not sent tanks for the tar to be taken away in, in consequence of the frost having closed the canal at Derby, but that he had asked for some *débris* to be sent him in order to make a coarse asphalte. He visited the plaintiffs works after the commencement of the present action, and saw the attempt which had been made by the defendant Company to prevent the flow of tar into the brook, but it was only partially effectual, because he saw tar percolating in small quantities through the wall into the brook.

Samuel Wilson, a workman in the employ of the plaintiffs, said he assisted in clearing the plaintiffs dam in 1879, when the weir was broken by the floods. There was a quantity of tar on the bottom of the dam. He examined the bottom of the dam again the week before last, and there was still tar mixed with the mud.

This was the case for the plaintiff.

Justice FRY: What do you ask for, Mr. North?

Mr. NORTH: For an injunction to restrain the defendant Company from pouring gas tar or other noxious matters into the Hipper to the injury of the plaintiffs.

Justice FRY: The difficulty I have is as to the "other noxious matters."

Mr. NORTH said he would ask for an injunction for other noxious matters connected with gas tar.

Mr. BEALE said the defence was that the brook was a receptacle for tarry substances which came from other sources, and that the gases were stirred up by recurring gases.

Mr. *John Reid*, Gas Engineer to the defendant Company, said that he remembered the construction of the gas-works, and was present during the excavations which were made. Pure tar was then found in the soil. The drain from the Company's works was in existence before the Midland Company's gas-works were established. The tar storeage tank was built of brick, with a foot of puddle outside, and blue bricks and cement inside. There was no outlet from the bank nor from the brook. The bank was below the surface of the ground, and the tar could only be taken out of it by pumping. The residual products of gas manufacture were of great value, and the tar and ammoniacal liquor were sent in travelling tanks to Derby and sold. Polluting matters were poured into the brook from other works. In October, 1878, a leakage was found in the tar-tank, but the defect was made good before the end of the month, and there had been no leakage from the tank since that time. He first heard of Mr. Slack's complaints on the 22nd of February, 1879, and he examined the drain the next day and found it very foul, containing traces of tar. The course of the drain was diverted, and the old drain cleared out and covered up for a length of 65 yards. In the following June he examined the tar-tank, and found no escape of tar. He was present at the cutting of Holm Brook, and saw in it deposits of tar which appeared to be the deposits of many years. What was done to the mouth of the drain by the Midland Company was of a very substantial character.

Cross-examined: The drain was always an open one until it was stopped up by the defendant Company. If tar was found on their side of the puddle, it could not have found its way there from the River Hipper. The drain had never been opened since it was laid. The Midland Railway Company commenced making gas at the end of September, 1878, and prior to October the 6th had manufactured 86,000 cubic feet. It was not true that an overflow drain was made from the tar-tank to the River Hipper. An overflow drain was made from the gasholder to the river. There was no outlet from the tar-tank except the man-hole at the top.

Re-examined: The water in the Holm Brook looked so clear and pure that some people said they could drink it. He should not like to drink the water himself.

Mr. *William Stephens*, Locomotive Foreman in the Midland Company's employ, said he had charge of the Midland Gas-Works at Chesterfield. The drain was altered in the spring of 1879, when a new siding was made. When the alteration was made he was present, but did not observe any tarry matter in the drain. When the leakage occurred he did not superintend the stopping of the drain. He received no complaints of tar escaping into the river before the leakage occurred.

William Waterfield, foreman gas maker in the defendant Company's employ, also gave evidence.

Francis Glossop said he was employed by the Midland Company in 1878 to examine the tar and ammoniacal liquor tanks at the Company's gas-works at Chesterfield, in order to see whether there was any leakage. He examined the tanks in the month of November, and found a leakage in the tar-tank, which extended through the brickwork and into, but not through the puddle. He repaired the leakage. In May, 1879, he received an order to divert the drain or dyke into the well at the end of the retort-house. The drain was diverted, and afterwards made good. He found the drain had been partly puddled. A wall was built across the dyke, and before that strong puddle at least a yard thick was put in.

Cross-examined: When he examined the tanks the witness Waterfield told him that he thought there was leakage from both tanks. He found there was internal leakage from the ammoniacal liquor tank through the brick wall into the tar-tank. The outside of the tar-tank was from 2 ft. to 2 ft. 6 in. from the open drain.

Mr. *Henry Woodall*, Engineer of the Leeds Corporation Gas-Works, said he visited the defendant Company's gas-works at Chesterfield in May, 1879. He examined where the open dyke had existed for traces of tar, but did not find any. From there he went up the river for a distance of about 150 yards, but there were no traces of tar or leakage. He went up the stream, and took out some of the mud from the bottom of the river above defendants works. Tarry matter exuded from the mud. On stirring up the mud at the bottom of the river tarry films rose to the surface in sufficient quantities to cover an acre of land. He examined the tar-tanks at the defendants works, but saw no signs of leakage. He found the works exceedingly well constructed, and substantially carried out in every respect.

Cross-examined: He found the traces of tar in the river opposite the silk-mill dam. He had been to the same places twice since May, 1879, but had failed to discover signs of tar.

Mr. *John Goole*, Surveyor, of Chesterfield, said he was Engineer for the Lower Brampton sewage-works. In carrying out those works he cut across the Holm Brook in August, 1879. Excavations to the extent of 4 feet were made in the brook, and the whole of the material got out was saturated with coal tar. An excavation of a deeper nature was this year made across the river, and the character of the material was the same as was taken out in the first excavation. He had a hole sunk, and in a short time it was filled with pure tar.

Dr. *Angus Mackintosh*, Medical Officer of Health for the Chesterfield Union, said that in 1877 the River Hipper was polluted with gas tar and sewage matter. The Chesterfield Gas-Works were the cause of the gas tar being in the river at the time. He did not take any samples or make any analysis, and he judged it was polluted from its appearance.

Mr. *Dyer*, an Analytical Chemist, and Mr. *Paton*, the Permanent Way Inspector for the defendant Company, were also examined.

WEDNESDAY, Nov. 17.

Henry Harrison, a timekeeper in the employ of the defendants, said he remembered the Company making a bridge over the Holm Brook in 1875. Excavations were made, and in doing so they came upon a drain which communicated with the brook, in which large quantities of tar were found. The tar was not in communication with the river, in consequence of a dam that had been erected.

Cross-examined: After the floods had subsided in June he saw tar on the grass, and had often seen tar about the gas-works, but did not take particular notice.

George Mowbray, a mason, said he was employed in the erection of a bridge over the Holm Brook about four years ago, and remembered coming upon an old drain, which was about three parts full of tar. In March, 1879, he found tar in the dyke, but not in the part nearest to the defendant Company's works.

Wm. H. Fletcher, a labourer, said he had resided near the defendants gas-works for 21 years. He had seen tar in the river long before the Company's works were erected; and on many occasions, after floods had subsided, he had seen tar on the banks. In June, 1879, he dug in several places above the weir, and in most of them found tar. He was not engaged to do this. On one occasion he was employed by Messrs. Slack and Sons to clean out the bottom of the dam, and among a lot of bricks and rubbish he found tar. That was six or seven years ago.

Wm. Bradley, *Joseph Darley*, and *Henry Buckstone* also gave similar evidence.

John Dove, a milk dealer, of Nottingham, deposed to having lived for 18 or 20 years at Chesterfield. Up to 1873 he had worked for Mr. Mills, whose tannery was on the same dam as the plaintiffs. He washed, limed, and took the wool off the skins. Tar used to get on the skins when washing them. When water was in the dam, spots of many colours could be seen on the surface of the water.

Cross-examined: All the time he was with Mr. Mills they were inconvenienced by tar being in the water. It was only when the skins were washed in the brook that they were brought into contact with tar.

George Tattersall said he had worked for Mr. Hopkinson. When skins were put in muddy water they were stained, but if the hair had not been taken off, the stains were easily removed.

Mr. *Benjamin Dawes* said he was foreman at the Chesterfield Town Gas-Works up to Dec. 5, 1879, but was now Manager of gas-works in Ireland. On one occasion he was crossing the river and saw tar floating down. He at once went into the works, and found the spent liquor of tar had been running away. This accident occurred on the 15th of May, 1879. A similar accident occurred on the 12th of May, and the liquor was run off in the same way.

Cross-examined: On the 14th of June the drain became stopped up, and on opening it tar was found in considerable quantities. Assuming that large quantities had been poured down the grating in the yard, it would account for the existence of the tar in the drain.

On the conclusion of the evidence for the defence,

Mr. DAVEY said he did not dispute that the presence of tar in the water was injurious, or even that the tar was present during the years 1878 and 1879; but what he submitted was that the plaintiffs had not shown that the tar proceeded from the Midland Railway Company's works.

SATURDAY, Nov. 20.

Mr. DAVEY to-day concluded his address for the defence. He said his theory was that for years the dyke had been a receptacle for tar, and that it was liquefied by the action of the surface and roof drainage which flowed into the drains. The presence of tar was not due to a material escape from the defendant Company's works. The evidence in favour of this theory showed that the tar was present before their works were constructed, and that Mr. Slack's statement that tar was not discovered prior to 1878, was, either from error of judgment or from strong partizanship, not worthy of acceptance. Tar was in the river before defendants works were commenced, and it was not his (Mr. Davey's) business to show where it came from.

Justice FRY, without calling upon Mr. Aston to reply, proceeded to deliver judgment. He said the defendants did not seriously contest the pollution of the water used by the plaintiffs, and the real controversy between the parties was as to the source of pollution. According to the story of the plaintiffs, a certain dyke having an outlet into the goit, was the source, and that down this dyke coal tar escaped from the defendant Company's gas-works. On the other hand, the defendants said the mouth of the dyke was for many years an open passage, up which the water washed the tar brought down from the upper portions of the stream, thus forming an accumulation of the matter complained of. In his (Justice Fry's) opinion it was proved that there were in the upper portion of the river considerable accumulations of tar, but where it had come from he could not say. The real question was whether this tar had flowed into the dyke. In order to answer this question satisfactorily, he must examine the evidence. The plaintiffs observed tar about the month of October, 1878, and they made frequent complaints to the defendants during that autumn and winter, and the early spring of the following year. The defendants for some time seemed to take no heed of the complaint. Stevens, who had charge of the works, said he never looked for, or made an examination in regard to the escape of tar until the drain was constructed in the spring of 1879. The defendants then made a fresh ditch in place of the old dyke. They took out the whole of the old soil, which, according to the defendants, was the only soil saturated with tar, and puddled up the end of the dyke. Therefore, the whole of the tar was removed, together with the soil that was impregnated with tar. This work was finished last year on the 27th or 30th of May; but there was evidence, upon which he placed implicit reliance, showing that tar escaped or oozed through the puddled wall after its completion, and after, the defendants would have him believe, every possible source of pollution had been removed. Several witnesses had spoken to this fact, the latter seeing tar ooze through on the 3rd of June. On the 13th of May the defendants works were visited by Mr. Slack and Mr. Allan, and upon some

ashes being removed, the tar poured forth in a thick stream. Evidently this was the point of maximum pollution, and he had the greatest difficulty in believing it was the result of accumulations in the open mouth of the dyke. It was more likely it came from the works. Another point for inquiry was at what time the pollution from defendants works commenced. The town gas-works had been in existence 30 or 40 years, and the defendant Company's works commenced in December, 1877, and increased their operations in 1878, and all the witnesses for the plaintiffs attributed the commencement of the pollution to the autumn of 1878—a time that was consistent with the theory that it came from defendants works, and inconsistent with the contention that it came from the town works. And, further, there was evidence to show that the works of Mr. Hopkinson and Mr. Mills, tanners, whose premises previously existed on the site of the defendants works, were not impeded by tar from the town works. In his opinion, therefore, the source of the pollution was solely from the outlet between which and defendants works there was some connection; but what it was he could not say. It was probable that the tar which was poured on to the ground by the defendants found its way into the drain, and thus formed the connection. It was needless, however, to speculate as to the source. The evidence proved to his mind that tar did flow from the works into the drain, and that it flowed at a time when serious injury was being caused to plaintiffs business. It followed that he must grant an injunction to restrain the defendants from discharging gas tar, or allowing the same to escape from their works, into the River Hipper or its branches, so as to pollute the river or its branches, to the injury of the plaintiffs. He should also grant an inquiry before the Chief Clerk as to the amount of damage sustained by the plaintiffs.

QUEEN'S BENCH DIVISION.—Thursday, Nov. 25.

(*Before Justices* Field *and* Manisty.)

NEW RIVER COMPANY *v.* THE VESTRY OF ST. PANCRAS.

This case was before the Court on the 17th inst., and was fully reported in the last number of the Journal.

Justice Field, in delivering judgment, said: This is a special case upon an appeal by the New River Company against a rate for watching and lighting, made by the parish of St. Pancras upon the appellants, in respect of their mains and pipes running through the parish. It is well known that the pipes and mains of the large Water Companies are for many reasons laid, with a view to the convenience of the Companies, and no doubt on account of the easier acquisition of land, under the various streets and roads of the different parishes in London. The complaint which the appellants make against this rate is that they are rated in a sum of £15,520 in respect o fall their mains and pipes in the parish, whereas they allege that they are exempt from that liability in respect of a very considerable portion of the mains. If their contention is right, the rate, in whole or in part, will have to go back to be amended, but if they are assessable in respect of the whole of their mains in the parish, then the rate must stand confirmed. The circumstances under which the question arises are these: The old parish of St. Pancras was a very large one, and many years ago—beginning, in fact, as far back as 1773—the various owners of property in the parish proposed to let out their estates on building leases; accordingly, they planned their proposed streets and roads, and made the various allotments of the ground which they intended to let. But in 1843, when the last Act of this kind was passed, the parish was divided into 18 different rateable areas. One of these was the old parochial portion of the parish, and their municipal wants were attended to by the guardians or directors of the poor in the Vestry. The remaining 17 consisted of different areas of land held by different owners to whom I have before referred; and in each of the districts a distinct Act of Parliament applied, appointing different persons as Commissioners for the purpose, first of all, of cleansing, lighting, paving, &c., and next of making a rate upon the persons who are described in the Act as the persons chargeable, in order to recoup themselves the expenses so occasioned. This state of things continued till the passing of the Act 18 & 19 Vict., cap. 120, by which the Metropolitan Board of Works were established, and then there was a general law laid down which is applicable to the parish of St. Pancras, amongst others, whereby all the powers of paving, lighting, &c., which were granted to or vested in any Commissioners or body other than the Vestry, were directed to cease and to be vested in the Vestry. By the 165th section of this Act it was enacted that in every parish or part of a parish in which land was, under any other Act than the 3 Wm. IV. wholly exempted, it should continue to be wholly exempted; and it was under this section—confirmed as it has been by a subsequent decision which we thoroughly adopt and act upon—that the New River Company claimed that they were improperly assessed in respect of their mains situate in 9 of the 17 districts into which (other than the parish) the parish had been thus divided. It is argued that if the hereditaments in respect of which they were rated were not chargeable under any one or more of those Acts, they are exempted by the operation of the 165th section, and so were not liable to be rated at all. The districts in question were, as I have said, created by these private Acts of Parliament, in which the bodies of Commissioners were named, and each of them remained with the power of doing the necessary works, and levying rates for that purpose. The districts by themselves contain altogether, out of the 2540 acres which is the area of the parish, 1790 acres, leaving only 750 acres under the control of the Vestry. It was conceded on the part of the appellants that the language of nine of these Acts was sufficient to indicate an intention to charge the occupiers of hereditaments—that the terms were large enough to effect this purpose; but in respect of the remaining eight the contrary was asserted. The case was argued by Mr. Webster, on the part of the appellants, first taking the nine Acts, by which he said the Company are not liable, and then comparing the language of the remaining eight, for the purpose of showing the grounds upon which they were obliged to concede that in those cases no exemption was created. But perhaps this mode of conceding the question might lead to a little misunderstanding, and it seems to me to be better to consider it from the beginning, because I cannot at present come to the conclusion, *à priori*, that the Legislature could have had any particular intention of making a difference between one estate and another. Of course they may have done so, and the question whether they have done so or not is the one we have to decide. It seems to me that, this being in effect a rate of the same character as a poor rate, and in some of the Acts directed to be levied in the same manner as a poor rate, the general intention of the Legislature must be taken to have been that the expense should be borne by the same hereditaments existing under the same circumstances in each and every of the same districts. No reason was pointed out to us at the Bar why there should be any *à priori* intention to make the mains and pipes rateable on the Bedford Estate, for instance, and not rateable on the other estates. The circumstances attending these different estates are the same; the hereditaments are of the same annual value and of the same character from beginning to end; and therefore, instead of picking out the different estates, as, for convenience sake, was done in the argument, when we come to decide the question it is better to look at it as a whole—to consider what the intention of the Legislature was, as collected from the whole legislation, to see what the language used is, and whether, in any particular case, it is such as to indicate a different intention on the part of the Legislature. We must recollect, further, that at the time when these Acts came into operation, each of the estates was not a completed estate of houses and streets, but was a large plot of land laid out for building purposes. Under these circumstances there must, of course, have been a quantity of land in an intermediate condition. Before the estate was laid out it was perhaps a field, or an orchard, or a market garden, and had an annual value as such; or it might have been a gentleman's house and garden, also having an annual value. But the effect of the operation of letting it out for building was to destroy all those original elements of rateability, and to cut up the estate into plots of immediately productive and immediately unproductive land; because as soon as a house assumes a lettable value the Act of Parliament states that it is to be rated. Another plot of ground may be vacant, and there must of necessity be more or less of these vacant pieces of ground, extending over a building estate, which have ceased to have that rateable value that they had before the operation commenced, and have not reached the rateable value which they will have when they have been turned into tenements and buildings. I think this consideration is of great value in construing the language of these Acts of Parliament, in which it will be found that a great deal turns—in fact, everything turns upon the particular language employed. The nature of the rate is also a general matter to be taken into account. The rate we are dealing with is a lighting rate, but the words of the enactments apply to a good many other rates—paving, watching, cleansing, lighting, watering, and the like. I think it was not contended that the language used in imposing this charge was language to be applied merely to a lighting rate. There is, no doubt, a difference in the language. As I have already said, we should clearly expect that there would be uniformity of intention, and one would have hoped to find in the Acts a uniformity of language. It is no doubt very much to be regretted that there should be 17 Acts of Parliament, all relating to one parish and to the rateability of hereditaments in that parish, and that in no two scarcely—certainly in no three or four—is the same language used. It is, however, easily accounted for; because it is well known as a matter of practice, in regard to Estate Bills like these, that the Bill is drafted by some particular conveyancer, who uses his own form of words, and thus it is that in almost all these Acts different language is employed. Another general remark I wish to make is that perhaps at the time the Acts were passed the nature of the particular hereditament in question—namely, the mains and pipes of a Water Company—had not assumed that prominence as a rateable hereditament which they have had in modern times. Nevertheless the present Company have ever since the reign of King James the First brought their pipes to London. The Westminster Company were in full force at that time, and their rateability was in discussion. I therefore cannot assume but that this particular hereditament was one within the contemplation of the Legislature when they were enacting who was to bear the expenses to be covered by the rate in question. Now let us see what are the peculiarities in the Act of Parliament. First, as I have said, I conceive that there is no reason why it should be intended to levy a rate in one district and to exempt another district, or why Acts should be passed making a district rateable, and others making a district exempt. The former of these Acts related to the South-Western Estate, the Foundling Estate, and the Doughty Estate, and they were passed respectively in 1772, 1794, and 1797, and it is conceded that in all these cases the mains and pipes are rateable hereditaments, and yet it is said that by Acts passed in 1803, 1808, 1810, and 1811, they are not; and in 1813, again, we get a series of Acts in which it is admitted that the language is sufficient to establish the rate. Now, before I deal with the particular Acts, let us see whether there have been any principles laid down with reference to the proper mode of considering them. There were quoted at the Bar three or four cases which it is important to bear in mind in considering the language of the Acts of Parliament, and how far any or all of it imposed a rate upon the appellants in respect of this property. The first case in point of date, and also in point of importance, is the case of *The King v. Manchester and Salford Water-Works Company* (1 B. & C., 630). This is a case *in pari materiâ*, because it was a Water Company, and there was a similar charge intentionally made, or sought to be made upon them in respect of their mains and pipes. In that Act the word "tenements" was the word relied upon, and it was very much used throughout the whole Act. The Court took into consideration the meaning of the word as used in the Act. Justice Bailey says: "The word occurs in this part of the Act, and is altogether associated with words which denote buildings." He then points out that a particular class of land was charged—namely, garden ground and gardens—and then shows how, in every other part of the Act, the word "tenements" was used in association with "buildings." The Court came to the conclusion that in this Act the particular rateable hereditament was not included. Another case which followed not long after was relied upon by Mr. Poland, and Mr. Webster brought it before the Court in the course of his argument. This was the case of *The King v. Shrewsbury*, and in that case the Act of Parliament was for paving, watching, and lighting. A rule of construction was there established, which I think I am bound to act upon. The charging clause, if I may use that expression, includes houses, shops, and various other things—coach-houses, yards, gardens, garden ground, stables, cellars, and other buildings and hereditaments. The Act also contains these important words: "except meadow and pasture." The question was whether the mains and pipes were chargeable under this Act. It was contended, on the part of the Company, as it is contended now before us, that inasmuch as there were only the words "other buildings and hereditaments," the general words which followed after "houses, shops, and buildings" were to be held, according to the well-known rule of construction, as restricted to things of the same character as those previously described, and upon this ground it was contended that the mains and pipes were not chargeable with the tax. On the other side, it was urged—and this was the construction which the Court adopted—that inasmuch as there was afterwards an exception of a particular part of land—namely, meadow and pasture ground—and inasmuch as meadow and pasture ground were not struck at by the enacting or charging clause, the exception of one particular part showed that more than this was intended to be included. Therefore, upon going back to the charging clause, and finding that the only word in it was "hereditaments," it was clear, they said, that they must give to this word a larger sense than merely *ejusdem generis*, and take it as including land and ground; therefore under those circumstances there was no way of stopping short of giving to the word its full legal value, which would include land occupied by pipes, that being in recent times declared to be the principle upon which water companies are rateable as occupiers of land by means of their pipes. I think I need only advert to one other case, which is a case greatly relied upon by Mr. Webster—namely, the *East London Water-Works Company v. Mile End Old Town*. This also is the case of a Water Company and a lighting rate, and again the Court followed the same construction of the Act as was adopted in the case of *The King v. Manchester*. They held that upon the language of the Act, although a remarkable distinction occurred there—the word "tenements" occurring in the very beginning, or governing clause—it was a Company with messuages, tenements, coach-houses, &c., and in

the absence of any other words than these the Court adopted the same construction as in the case of *The King v. Manchester*, and with that construction the appellants did not quarrel. Therefore, it may be taken as settled law. Whether I could have originally come to the same conclusion from the Act of Parliament it is not for me to say; I am bound by it, and it is conceded that it must govern this question, unless some distinction exists. The argument was conducted on this principle at the Bar. This leads me to consider whether the present case is brought within the principle laid down in the first and third cases, or within the principle laid down by the Court in the second case to which I have referred. Let us consider how the matter stands. Of course the general intention must be looked at. One cannot help thinking that there must be a general intention to make these hereditaments rateable throughout the parish. The principle, however, must not be carried too far; it is not for me to legislate; if the Legislature has not expressed its intention, it is not for me, although I think it exists, to carry the Act of Parliament one whit farther than its language enables me to do. In regard to the South-Western Estate Act, the earliest in point of date—1772—the preamble shows what I have just stated to be the character of the estate—namely, that it was an estate being laid out for building purposes. It particularly recites that it was not completed, for it begins by saying: "Whereas the parish of St. Pancras is very large and extensive, and of late years several houses have been erected upon such part thereof, and several other buildings are likely to be erected within that part of the said parish;" and one or more of the clauses in the other Acts point clearly to the incomplete condition in which the estate was, because it is declared over and over again that the rateability of a house is to come into a particular year after a particular thing shall have happened—that it shall not be chargeable now, although the building has been commenced, but it is to come into the year's taxation when the house has arrived at a certain stage with reference to the pavement, so as evidently to make it likely that it has reached its pound rate value. Now, the charging clause here is one of those which it is considered did charge the Company. The words are very clear: "Any land, ground," and so on. If I remember rightly, there was in that case no exempting clause, or no different principle of rating such as is to be found in the other Acts of Parliament. The next Act in date was 1795. That was the case of the Foundling Estate, in which it was also conceded that the hereditament was chargeable. There again the language is, "shall enjoy any land, ground, house, or tenement;" and there is a clause (section 42) which points to a wall or void space of ground, in regard to which the principle of rating is varied in this way: All the other hereditaments suppose an annual value capable of being let at an annual rate, but the void space of ground, the meeting-house, the school, and the wall, were considered as things that would not be able to bear a pound rate upon them; and consequently a mode of rating was adopted which was to take the pavement in front of them up to the middle way, and assess them upon the area of that pavement, taking care that it should not exceed a certain sum in the year. No. 12 is on the same principle. These three Acts are the first three on this subject. Now I come to one which is relied upon by Mr. Webster, and under which he claims exemption. It is the Bedford Estate Act, passed in the year 1800. It recites that the Duke of Bedford is the owner of large property, and it says: "Whereas it is intended to make several streets, squares, and other public passages and places on the said pieces or plots of ground," &c., and that it would contribute to the public benefit and safety if Commissioners were appointed. Now we come to the rating clause—section 37—upon the construction of which the real principle of this case must turn. It begins by saying that for raising money to enable the Commissioners to carry the purposes of the Act into execution, "a rate or rates for paving, repairing, cleansing, lighting, watering, and watching the streets and squares shall be laid by the Commissioners once in every year upon all houses, shops, warehouses, coach-houses, stables, cellars, vaults, buildings, and tenements." Then it goes on to describe what the rates are to be—namely: "For repairing, paving, cleansing, and lighting, 2s. in the pound, according to the yearly rent or value of such houses, shops, warehouses, coach-houses, stables, cellars, vaults, buildings, and tenements." That was all to be done by a pound rate—namely, "according to the yearly rent or value of them." Now, taking this clause by itself, Mr. Webster argued very powerfully that there was no distinction to be drawn between the language of this Act and that cited in the case of the *East London Water-Works Company v. Mile End Old Town*; and Mr. Poland conceded that this was so; but he relied upon another clause in the Act—viz., section 40. His argument was that the word "tenements," in company with houses, shops, and warehouses, cannot be extended beyond them, and therefore "tenements" must mean something *ejusdem generis* with buildings, stables, cellars, and so on. "Then," said Mr. Poland, "here is section 40, which says: 'Provided always that the rates to be made by virtue of this Act upon or in respect of any chapel, meeting-house, school, or other public building, or any wall, garden, yard, or void space of ground, shall be ascertained according to the amount,'" which I have just described—namely, the area of the pavement. Now this is not a charging clause; it does not say: "Be it enacted that these things about to be mentioned shall be charged with the rate;" but it says that the rates made by virtue of the Act shall be ascertained in a particular way. "Therefore," says Mr. Poland—and in this construction I feel bound to concur with him—"it is evident that these things at least must be included in some prior charging clause." It is a well-known principle of construction that an Act of Parliament charging the subject must do so by clear and apt words. If, therefore, the 40th section assumes that the things about to be mentioned are to be assessed by virtue of the Act, but are merely to be assessed in a particular way, we must go back and see where and when the Act did assess them, and by what language. We find that it mentions "chapel, meeting-house, hospital, school, or other public building." What has been said about them before? Nothing specifically; but in the charging clause I find the word "building" in general. Therefore it is obvious that there is a word which includes them all, as you would expect to find, and do find. But, then, where do we find the words "wall, garden, yard, or void space of ground"? They have all been charged, it is certain, by some clause or other; but where, and how? Going back, there is but one word under which they can be charged, and that is the word "tenements." Now, applying the construction laid down in the case of *The King v. Shrewsbury*, with regard to "meadow and pasture ground excepted," it shows that meadow and pasture ground at least are included; they had been included under some word, and the only word that could have included them was "hereditaments." It was, therefore, held to include not only the species of things of the same nature, but ground of every description. At the time the case was being argued I asked Mr. Poland whether he could suggest any limit. He did not supply us with one, but it strikes me that a fair limit might be put by looking at the mode in which the rate is to be raised—according to the annual value. Therefore it seems to me that I am bound, in this Act of Parliament, to hold, as I do hold, that the void space of ground having been clearly included in the 37th section, and the only word under which it could have been included being "tenements," therefore I must give the word "tenements" a larger meaning, and that larger meaning seems to me to be, "land capable of being assessed at an equal pound rate"—that is, at a value to let, as distinguished from walls and void spaces of ground which have attained no such annual value. Therefore, in my judgment, the hereditament in question does fall within this section. The same principle will apply to No. 11. In regard to No. 12, the liability is admitted. No. 3 is the disputed case, and there, I think, the same construction will apply; indeed, it will apply to Nos. 2, 3, 5, and 6, in all of which the legislation is in substance the same, the charging clause using the general word "tenements," and some subsequent clause, either in itself or by reference to a prior Act of Parliament, declaring that in the general clause they have included some species of land; therefore, in my judgment, they have included the hereditament in question, this being land capable of being let at an annual value. In regard to No. 17, the liability is admitted. I think there is only one other expression, "void spaces;" but I do not think that this makes any distinction whatever between that Act and the others; and, as Mr. Poland observed, if void spaces are to be rated upon any principle, why should a valuable hereditament like this be exempted? There is one case in which the language has a variation—the case of the Holmes Estate, No. 9. There it is said that the rate "shall be borne and paid by the tenants and occupiers of all and every the grounds, houses, shops, stables, yards, gardens, vaults, and other buildings." I believe there is no clause in the Act about void spaces of ground. With regard to this Act it was contended on the part of the appellants that "hereditament" was not included within the word "grounds." If it had been the word "ground" Mr. Webster said it would not have been disputed. He contended that the letter "s" made all the difference, and that the word "grounds" must have some particular meaning not so large as to include the hereditament. I asked him what grounds, and he said "a gentleman's grounds," and I do not know that he could have given a more apt answer; but one naturally asks why there should be any difference in regard to taxation between a gentleman's grounds and any other grounds. I think we must take it that the Legislature must have intended to charge the same thing as they were charging elsewhere. It is a remarkable circumstance, which I did not know at the time of the argument, but which I happened to light upon accidentally, that the statute of Elizabeth uses the word "lands," showing that the addition of the letter "s" does not mean to indicate any particular piece of land or ground, but indicates grounds at large. It is hardly necessary to go through the remaining Acts of Parliament. The conclusion at which I arrive is that the New River Company are rateable as occupiers, by their mains and pipes, throughout the whole of these districts, and that consequently the rate stands affirmed.

Justice MANISTY: I am of the same opinion.

Judgment was accordingly entered for the respondents, with costs.

HARTLEPOOL PETTY SESSIONS.—TUESDAY, OCT. 16.

(*Before Messrs.* GROVES *and* HORSLEY.)

ILLEGAL CONSUMPTION OF GAS.

William Boland, a publican of Hartlepool, was summoned by Mr. T. Trewhitt, the Secretary and Manager of the Hartlepool Gas and Water Company, for unlawfully laying a pipe in connection with the Company's main service, so as to consume gas without its passing through the meter. The defendant admitted connecting the pipe, but said it was not with any fraudulent intention. He did not understand the construction of a gas-meter, and was not aware that the pipe in question took gas which was not registered.

It appeared from the evidence adduced that one of the Company's meter inspectors went to the defendant's house on the 20th ult., for the purpose of examining the meter; and then saw on the inlet a connection with a ¾-inch pipe. The connection led to a light on the counter with a small burner, for the purpose of lighting tobacco-pipes. He reported the matter, and the present proceedings were taken. In answer to defendant, the meter inspector said that the pipe was exposed; there was no attempt to conceal it. It might readily be seen by any one looking at the meter.

Mr. GROVES said that, in view of these circumstances, the Bench were of opinion that an illegal act had been committed, though he did not say defendant had done as he had with any fraudulent intent; but he would have to pay £5 and costs. Probably, however, the Company, if defendant represented to them that he was unaware of the illegality of the connection, might be disposed to mitigate the forfeiture. He wished to remark, however, that future cases which might come before the Court would be dealt with by the Bench with greater severity than this one.

Mr. TILLY, on behalf of the Company, said he was glad that his Worship had made this remark; it was not for the forfeitures the Gas Company prosecuted, but merely to prevent the repetition of offences.

LIVERPOOL CITY SESSIONS.—FRIDAY, NOV. 19.

(*Before Mr.* J. B. ASPINALL, Q.C., *Recorder.*)

APPLICATION TO REDUCE THE CITY WATER-RATE.

An application was to-day made, on behalf of Mr. John Murphy, Secretary to the Liverpool Land and House Owners Association, to have the city water-rates reduced.

Mr. SEGAR, who appeared for the petitioner, said the present application was made in accordance with the provisions of the Liverpool Corporation Water Act, 1847 (10 & 11 Vict., c. 261), which was passed for the purpose of supplying water to Liverpool. By this Act the Corporation received power to borrow money for certain purposes, and also to make rates and charges for the purposes indicated by the Act. The persons for whom he appeared contended that the Corporation had nearly every year from that time to the present—but certainly in the year 1879—raised money for purposes other than those provided by the Act. The only powers that they had for raising money were—first, to pay off the debt upon mortgages; secondly, for the purpose of supplying water; thirdly, for the purpose of keeping that supply going by the necessary repairs. They had no power to accumulate a fund, or to lend any money which they themselves raised by rates for any other financial purpose; but, as a matter of fact, the Corporation had had something like £200,000 over and above the requirements of the water-rates, which they lent to themselves, and for which they paid certain interest.

Mr. M'CONNELL, who appeared for the Corporation, here interposing, said he had a preliminary objection to take.

The RECORDER (to Mr. Segar): Will you state shortly what your application is, in order that, if Mr. M'Connell has a preliminary objection, he may be in a position to take it?

Mr. SEGAR: I say that £200,000 has been raised for purposes other than the Act of Parliament; and I am going to ask you to reduce the rate after having made the inquiry which is pointed out by the Act.

Mr. M'CONNELL said the preliminary objection he had to make was that the Court had no jurisdiction in this matter. The machinery provided by the Act named by Mr. Segar was repealed by a subsequent Act—the Liverpool Corporation Water-Works Act, 1862. This Act altered, amended, and enlarged the Act of 1847 and other Acts.

Considerable argument having ensued upon Mr. M'Connell's objection,

The RECORDER asked Mr. Segar for a definite statement of his application.

Mr. SEGAR: My application is for you to order the Council to make a

reduction in the rents and charges for water for the year 1880 or 1881, as to you shall seem reasonable, so that the same shall be sufficient to produce the sum as near as may be equal to, but not less than the amount required for the purposes of the Act 10 & 11 Vict., c. 261, or any Act or Acts altering, amending, or extending the same, and any extraordinary sum which the Mayor, Aldermen, and Burgesses may be liable to pay in such year under the provisions of the said Act.

Mr. M'Connell repeated his former objection upon the application as now definitely made.

The Recorder said it appeared to him that the question was too important to be decided without consideration. Of course, assuming that he should come ultimately to the conclusion that he had no jurisdiction to entertain this application at all, it would be utterly useless to expend a long time entering into elaborate arguments about figures. Therefore he did not propose to go on with this matter until he had made up his mind upon the question of jurisdiction. He might say, without committing himself, that his mind was a little in favour of Mr. Segar and against the objection. It struck him that if the framers of the Act of Parliament intended to repeal the elaborate provisions of the Act of 1847, they would have repealed them in the ordinary form. This was the sort of difficulty that was in his way, and he proposed to adjourn the whole matter to the next sessions, when he would state what he thought about the question. If he decided that Mr. Segar was entitled to go on with his application, he could then do so. He would also remark that it was perfectly open to the Corporation, if they thought it right, to go for a prohibition if they considered the question of jurisdiction was a very important one. It would also be open to the other party to apply for a *mandamus*, if he decided that he had no jurisdiction. He would do his best to decide the question of jurisdiction before the end of the present year.

The matter was accordingly adjourned to the next sessions.

Miscellaneous News.

THE BERLIN MUNICIPAL GAS UNDERTAKING.

Annual Report of the Administration.

[Condensed from the Official Statements recently issued.]

There has been no material alteration in the administration or working of the city gas-works during the year 1879–80 as compared with the preceding year. The dulness in all departments of trade which has now existed without interruption since 1872, and which at first did not materially affect the gas undertaking, has in the long run proved very unfavourable to the development of the works, in comparison with the extension in proportion to the increase of population observed in ordinary times. On the one hand, there are fewer new houses being built, and, on the other, bad trade necessitates economy, and the consumption of gas is reduced to the lowest possible limits. This is especially the case with small tradesmen, who in many instances have quite left off the use of gas in favour of petroleum, which, although less efficient, is cheaper at its present low price. The proof of this observation is to be found in the decrease which has taken place in the past few years in the number of small gas-meters in use. Still, in spite of all this, the consumption of gas in the past year was slightly greater than in 1878–79. This goes to show that the use of gas is extending in private residences, and also for industrial purposes, which is also proved by the rising consumption of gas during the day.

The financial result of the year's working is very satisfactory, partly owing to the lower price of coal and the increased value of residuals, and partly to the working results, a higher yield of gas having been obtained, and greater economy secured in the accounts for fuel, wages, and other current expenses, as compared with the preceding year. Although the profits of that year must be considered unusually large, those of the past year were, owing to the circumstances above-mentioned, more than 25 per cent. more.

It should, however, be observed that when the wished-for improvement in trade appears, this state of things will be very much altered. The price of coal and other materials, and the value of labour, would experience a corresponding advance, and the profits would be lessened in consequence, without the possibility of making any change in the working to counteract the loss. Even the increase in the gas consumption to be expected in case of such a general revival of trade would only partly and slowly act as a counterbalance to the decrease of profit. It should therefore be remembered that the results of the two last years must by no means be taken as normal, and that equal profits are not to be always expected.

As already mentioned, the production of gas in the year ending April 1, 1880, was somewhat larger than in the previous year, being 61,871,000 cubic mètres, as compared with 61,196,000 cubic mètres, or an increase of 675,000 cubic mètres, or 1·1 per cent. As the gas remaining in the holders on April 1, 1880, was 19,000 cubic mètres more than on the same day last year, the consumption of gas was 61,852,000 instead of 61,176,000 cubic mètres, or an increase of 1·105 per cent. In the year 1878-79 the consumption of gas was 0·21 per cent. less than in the preceding year, so that the increase in the past year as compared with 1877–78 was only 0·45 per cent. The increase in the number of burners was also inconsiderable during the year. On April 1, 1880, there were in private use 623,374 burners, and in public lamps 11,991; together making 635,365 burners in operation, showing an increase on the previous year of 2·34 per cent. in public, and 1·5 per cent. in private use, the gross increase being 9515 burners, or 1·52 per cent.

The gross consumption of gas in the past year was thus divided:—

Public lamps	8,519,776 cubic mètres	=	15·12 per cent.
Used in the works and offices	557,285 ,,	=	0·99 ,,
Private consumption. .	47,253,705 ,,	=	83·89 ,,
	56,330,766 ,,	=	100·00 ,,
Unaccounted for . . .	5,521,234		
Total	61,852,000 cubic mètres, as previously stated.		

The proportion of the gas consumed in public lamps to the total consumption was only 14·83 per cent. in 1878–79, thus showing a slight increase for the past year; but the percentage of private consumption diminished from 84·09 to 83·89 as stated. The average yearly consumption of a public lamp in a leap year is 718·965 cubic mètres; but last year, owing to the addition of new lamps, it was 717·70 cubic mètres, as against 714·85 cubic mètres in the previous year. The increase is due to the additional day, in which the quantity consumed is 2340 cubic mètres. The amount of average consumption of the private burners was also slightly more, being 76·27 cubic mètres as compared with 75·70 cubic mètres.

The loss of gas by leakage, &c., has increased by 329,336 cubic mètres during the year, and equalled 8·93 per cent. of the total consumption, as against 8·49 per cent. in the preceding year, showing an increase of 0·44 per cent. When the great alterations in the mains, and on account of the new paving of the streets, are considered, this increase does not appear great.

The greatest production of gas on any single day of the year was on Dec. 22, 1879, when the four works made together 292,600 cubic mètres of gas, the maximum of the preceding year for ordinary purposes having been 289,800 cubic mètres. The minimum production was 75,100 cubic mètres, on July 2, 1879. The greatest consumption during seven continuous days was from Dec. 17 to Dec. 23, 1879, when 2,020,800 cubic mètres of gas were used. This is 44,500 cubic mètres less than for the similar period of the previous year, partly owing to bad trade, and partly to finer weather, only one of the seven days having been foggy. The greatest consumption in one day was on Saturday, Dec. 20, 1879, when 317,000 cubic mètres were consumed, an increase of 3·93 per cent. on the heaviest day's consumption of the previous year, due to bad weather. The maximum consumption in one hour on this occasion was 35,100 cubic mètres, between five and six p.m. In the preceding year the heaviest hourly consumption was 37,250 cubic mètres. The smallest day's consumption was 66,300 cubic mètres on June 29, 1879, as against 65,300 cubic mètres for the lowest of the preceding year, or an increase of 1000 cubic mètres. Consequently, during 1879-80 the proportion between the minimum and maximum daily consumption was 1 to 4·77, as against 1 to 4·67 in the previous year; between the maximum daily consumption and the total yearly consumption the proportion was 1 to 195·1 as against 1 to 200; and between the maximum hourly and daily consumption it was 1 to 9 against 1 to 8·18 in the previous year.

The quantity of gas produced from the coal carbonized, great as it was in 1878-79, was last year still more considerable. Although there was an increase of 675,000 cubic mètres in the gas made, the quantity of coal used was only 216,058 tons, or 155·2 tons less than in the previous year. The make of gas per ton of coal was 286·6 cubic mètres (10,117 cubic feet); thus maintaining the steady improvement observable since 1876-77. This favourable result has been due to various causes. The quality of the coal has materially contributed to it, the coal from the Königin Luise pit, and also from Westphalia, having been especially excellent. This is probably due to the fact of there having been greater care observed at the pit in screening the coal, and also, in the former instance, of an unusually good seam being now worked. The better quality of the fire-bricks used in the settings, the use of gaseous fuel, and greater skill on the part of the stokers, may also have contributed towards an increased production of gas. To the last-named circumstance may especially be attributed the increase in the yield of gas per mouthpiece, from 242·2 cubic mètres (8549 cubic feet) to 258·8 cubic mètres (9135 cubic feet). There has been a corresponding reduction in the number of retorts in daily use, and in the number of charges, in spite of the increased production of the whole year. In the past year there were at all the stations 1,405,104 charges, and in the previous year 1,420,317 charges. The greatest number of settings in action on any one day was on Dec. 22, 1879, when at all the works 168 settings, with 1162 retorts and 6972 charges, were recorded; the corresponding numbers for the preceding year being 174 settings, with 1226 retorts and 7132 charges.

During the year the alterations from grate firing to generator firing were further proceeded with. Of the total number of retorts in use, there were 129,815 retorts, or 54 per cent., fired with generators, the percentage of the previous year being only 47. In consequence of the high and uniform heat obtained with the generators, the experiment was made of setting eight and nine retorts in a bench, instead of seven as before, and the results have been satisfactory. As the extra retorts necessitate an alteration in the arches, they can, however, only be introduced gradually, as the benches need rebuilding.

The quality of the gas has been almost uniform throughout the year, according to tests made daily by Professor Rüdorff in the middle of the city, and published weekly in the official gazette. The illuminating power with an hourly consumption of 150 litres (5·295 cubic feet) was, on an average of 307 observations, equal to 17·2 English sperm candles. The maximum of 17·7 candles occurred four times in the year, and the minimum of 16·5 candles only twice. The tests made daily at the gas-works also gave corresponding results. The gas was always free from sulphuretted hydrogen, and the percentage of carbonic acid, ammonia, and sulphur in other forms than sulphuretted hydrogen was very inconsiderable.

There was no interruption of the manufacture at any of the stations during the year, and in consequence of the small increase of consumption no extensions have been necessary; but at the Gitschiner Street station an adjoining piece of land has been acquired for the purpose of widening the coal stores. The following renewals have been executed at the various works:—At Gitschiner Street the old retort-house, built in 1845, for 15 settings, has been pulled down, and a new boiler-house and stack are being erected on the site. Gasholders Nos. 1 and 2 have also been extensively repaired. At the Müller Street station, two gasholders also had to be repaired, and No. 3 retort-house, for 10 settings, has been pulled down, and the foundations of settings of 9 for generators have been rebuilt; the tar and liquor wells were also rebuilt. At the Griefswalder Street works, two retort stacks, each of 12 settings, were arranged for gas-firing, the old arches being utilized, and one generator being made to serve two settings. At the gasholder station in the Koppenplatz, arrangements had to be made for carrying on the supply of the Royal Opera, &c., formerly served from George Street, the site of which is to be given up to the city railways. Sundry extensive works of distribution, necessitated by the last-named alterations and otherwise, were carried out. The total length of the mains laid during the year was 27,702 mètres, and of the mains removed 17,759 mètres. The total length of mains, which on March 31, 1879, was 548,165 mètres, exclusive of service-pipes, has therefore been increased during the year by 9943 mètres, or 1·81 per cent., and was consequently on March 31 last 558,108 mètres. In consequence of the laying of pipes of larger diameter, the cubical content of the pipes in the city has been increased by 9·03 per cent., having risen from 22,254 cubic mètres on the last day of March, 1879, to 24,263 cubic mètres on the corresponding date of the present year. Only an inconsiderable number of new services were laid, on account of the diminishing number of houses built. Only 491 new supplies of gas were entered, and 164 services were cut off or taken away. [The price of gas to private consumers in Berlin is 16 pfennige per cubic mètre, equal to about 4s. 6d. per 1000 cubic feet.]

Sale of Shares in the Victoria (Newmarket) Gas Company.—On Tuesday last, Messrs. Feist and Son offered for sale in Norwich 28 £5 shares in the above Company. They were put up in six lots, four of five shares and two of four shares, and realized the following prices:—Lot 1 (5 new shares), £56; lot 2 (5 new shares), £58; lot 3 (4 shares, second issue), £42; lot 4 (5 shares, third issue, £3 10s. paid), £30; lot 5 (5 similar shares), £34; lot 6 (4 shares) £26.

Indictment against a Water-Power Company.—About two years ago an indictment was found against the "Society for the Promotion of Useful Manufactures," of Paterson, New Jersey, U.S.A., for not properly fencing in their raceways in the streets of the city. The indictment was carried to the Supreme Court, and this body has recently decided that an unguarded raceway is *per se* a nuisance; but, as the indictment did not set forth that the streets existed before the raceways, that fact must be established on the trial. As a point of fact the Society claims that the raceways were built 70 or 80 years ago, long before the streets were laid out.

ORIENTAL GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Friday last, at the London Offices, 14, St. Mary Axe, E.C.—JAMES SYDNEY STOPFORD, Esq., in the chair.

The SECRETARY (Mr. A. Hersee) read the notice convening the meeting, and the following report of the Directors was taken as read:—

In submitting the accounts for the twelve months ended on the 30th of June last, the Directors have to report continued satisfactory progress in the Company's operations.

The number of public lamps added during the year was as follows:—582 in the town of Calcutta, 94 on the Maidan, 34 in the suburbs, 16 on the canal bridges—total 726; thereby completing all orders at present received. The several new contracts for street lighting are now in full operation. Very liberal concessions have been made by the Company in the expectation of commensurate advantages hereafter. The proceeds of the Calcutta lighting rate for the past year did not prove sufficient to induce the Corporation to give the anticipated order for additional street-lamps, but it is hoped this will not be long delayed.

In private lighting there has been the addition of 198 consumers and 3080 burners. The extra consumption of gas by meter is encouraging, but the large increase of lights has not yet yielded to the revenue as might have been expected.

Upwards of 19 miles of new mains were laid during the year, and the Directors are pleased to state that, notwithstanding this additional length of pipes, the leakage has been considerably reduced.

Satisfactory contracts have been made for a full supply of coal for a period of three years.

The recent extensive provision of new plant and machinery has proved most serviceable, and the works are reported to be in excellent condition.

The Directors have still to regret the unfavourable state of exchange, with its effect upon the profits. It is feared that no immediate improvement can be expected.

The members of the Resident Committee have at all times given their best attention to the Company's interests. Mr. R. C. Noble has retired from India, and the Hon. J. B. Knight has been appointed to succeed him. The Directors have pleasure in again bearing testimony to the valuable services rendered by the Manager, Mr. Blackburn.

The general revenue account shows a balance (after crediting £2500 to the reserve-fund) of £19,330 12s. 7d., out of which the Directors recommend a distribution of 5 per cent., free of income-tax, payable on the 4th of December next, making, with the interim payment of 4 per cent. on the 4th of June last, a total dividend of 9 per cent. for the year.

The Directors who retire by rotation are Henry M'Lauchlan Backler and Charles Hill, Esqrs. The Auditors, Henry Lawrence Hammack and Thomas Newton Stokes, Esqrs., also retire. All are eligible for re-election, and offer themselves accordingly.

Balance-Sheet, June 30, 1880.

Dr.				Cr.			
30,000 shares of £5 each.		£150,000	0 0	Amount of plant on the 30th of June, 1879		£317,026	1 9
30,000 " "	(£4 paid)	120,000	0 0	Outlay during the past 12 months		9,853	7 10
15,000 " "	(£1 paid)	15,000	0 0				
		£285,000	0 0	Cost of plant to the 30th of June, 1880		£326,879	9 7
Loans on debentures		67,185	0 0	Services laid and meters in use		10,702	8 10
Reserve-fund		17,181	0 0	Amount due to the Company		7,769	0 8
Unclaimed dividends		625	6 2	Value of stocks, viz.—			
Amount due by the Company		5,935	18 2	Coals		4,315	16 2
Balance from general revenue account		19,330	12 7	Purifying material		301	8 0
				Products		691	12 3
				Fittings and meters		5,371	19 3
				Pipes		5,710	0 4
				Horses, conveyances, &c.		469	10 0
				Retorts & fire-clay goods		2,845	9 3
				Sundry stores		4,657	2 1
				Office furniture, &c.		360	19 0
				Cash in Calcutta		19,617	0 2
				Cash in London		1,566	1 2
				Bank bills in hand		6,000	0 0
		£395,257	16 11			£395,257	16 11

Profit and Loss, or Working Account, for the Twelve Months ending June 30, 1880.

			Gas-rental	£56,696	18 4
Manufacture & distribution—Coals, purification, and wages	£25,762	8 1	Coke, tar, fittings, &c.	17,436	1 11
Salaries in India & London	3,343	3 3	Transfer fees	31	0 0
Directors and Auditors	913	0 0			
Passage & general expenses	1,081	7 2			
Exchange	5,750	9 9			
Mains account	1,985	7 2			
Wear and tear and repairs	2,057	16 10			
Retort account	1,076	4 0			
Bad debts and allowances	63	16 3			
Balance	32,130	7 9			
	£74,164	0 3		£74,164	0 3

General Revenue Account.

			Balance on June 30, 1879	£17,389	5 9
Dividend of 5 per cent., balance of 9 per cent. for the twelve months ending June 30, 1879, declared at the gen. meeting, Nov., 1879	£12,687	10 0	Ditto on profit and loss account	32,130	7 9
Interim dividend of 4 per cent., on account of year ending June 30, 1880, paid June 4.	11,100	0 0			
Interest on debentures	3,313	2 7			
Income-tax	588	8 4			
Reserve-fund	2,500	0 0			
Balance	19,330	12 7			
	£49,519	13 6		£49,519	13 6

The CHAIRMAN, in moving the adoption of the report, said it would probably be remembered by the Shareholders that when he addressed them this time last year their Manager and the staff were very busy indeed preparing for the new contracts, in laying mains, erecting lamps, &c. He was now happy to say that everything was most satisfactorily completed by the time specified in the contract—viz., the 1st of May—and the new arrangements were started without drawback in any respect. He must point out that the accounts of the present year were somewhat more favourable than they would be under ordinary circumstances, for the Company received the rent of the old lamps up to the 1st of May at the original rate, and in addition to this they had received rent from the new lamps, many of which were ready before the time specified, and the Calcutta Corporation ordered them to be lighted. He mentioned this because the accounts for the current year would bear evidence of the liberal concessions the Company had made to get the contract, and the full strain of the reduced rates was now being experienced; but still the Directors felt that there was cause for great gratification in the knowledge that the Company's position was now secured for the next 21 years, and there was every ground to hope that the present prosperity of the undertaking would be continued. Under the provisions of the new contract, the Corporation had power to erect 500 new lamps in addition to those ordered at the time. In the last Budget 100 of these lamps were included as likely to be lighted immediately; but he was sorry to say that the lighting-rate fell short of what the Corporation expected, and the order for the lamps was not given. However, the saving to the Corporation was so great under the new contract that he had no doubt they would very soon order this number of additional lamps to be lighted. He was happy to inform the Shareholders that after the experience of the last six months the Directors had found no difficulty whatever in working according to the terms of the new contract. Everything had been done without a hitch, and to the satisfaction, as the Directors knew, of the Corporation. The extension of the Company's mains into fresh districts had brought them a great many new customers, the number of burners added exceeding that of any previous year, but these were taken by natives, who were not regular consumers of the gas. They did not burn it regularly, and therefore this revenue did not benefit the Company so much as might be expected; still they were glad to have the natives as customers, even though their consumption was only intermittent. The progress of private lighting in Calcutta during the year had been very satisfactory, the receipts being about £900 in excess of those of last year, which was about 5½ per cent. on the previous twelve months; but Howrah, he regretted to say, did not help at all in this direction. In bazaar lights the increased revenue was also very satisfactory—£140, or 7½ per cent. over that of the previous year. The bazaar lighting required continual watchfulness and care; but it was susceptible of very considerable increase, which the Directors hoped would soon be attained. The addition of 19 miles of new mains brought up the total length at Calcutta to 152 miles; and so well had the new pipes been laid, and so much attention had been paid to remedy all the defects, that the quantity of unaccounted-for gas was 4 per cent. less than it was for 1878-9—namely, 30½ million cubic feet against 32 millions; while the loss per mile of mains was reduced 16½ per cent. The Manager hoped that some further improvement might be made in this direction, but the treacherous nature of the soil in Calcutta forbade the expectation that the leakage could be reduced to the average of home working. The Shareholders would be glad to notice that the Directors had made most favourable contracts for coals, and were in a very good condition. They had had to pay a small enhanced price, but they would be partly, if not altogether, recouped by the increased price obtained for coke. The sales of tar last year were unfavourably affected by importations, but the competition was so well and boldly met by the Directors in reducing the price, that the parties who shipped would not be encouraged to repeat the experiment. The fixing of the new plant and machinery had placed the Company's works in a state of perfect efficiency, and they were now in a position, with a few additional retorts, to make gas at the rate of a million cubic feet per day; and this gas was delivered so free from impurities, that the Analyst of the Calcutta Corporation stated that it was very good in every respect. The one unfortunate item to which he must allude was the exchange. From time to time the Directors had been sanguine of an improvement, but their hopes had not been realized. The loss last year was certainly less than in the previous year, the average remittances being at 1s. 8⅝d., or 17½ per cent. on the amount remitted, as compared with 1s. 7⅞d., or 21¼ per cent. in the previous year. This was a difference of very nearly ½d. At present the rates were very low, but it was hoped they would improve as the shipping season came on, and the present was about the time for it. The Shareholders might rest assured that the Directors would use every exertion, as they always had done, to minimize the loss on exchange, by having their remittances timed judiciously. They continued to reduce the debenture debt as opportunity occurred, and it would be seen by the accounts that it was much less than last year. They had not paid off all that fell due during the year, having, at the request of some of their old customers, granted them a renewal at 4½ per cent., which was a further reduction in the interest. He would conclude by remarking that the results of the past year's working were perhaps, for reasons he had mentioned, exceptionally good, and justified an increased dividend; but having regard to the effect of the new contract on the present year's profits, it was considered prudent by the Board to strengthen the reserve-fund, and not alter the rate of dividend. He was sure the Shareholders would approve of the wisdom of such a course.

Mr. W. WHITE seconded the motion.

Mr. LOVEJOY asked whether the reserve-fund produced any interest, as it was a large sum to have accumulated, and it occurred to him that it ought not to be lying dormant. One of the paragraphs in the report he regarded as ambiguous. It stated: "In private lighting there has been the addition of 198 consumers and 3080 burners. The extra consumption of gas by meter is encouraging, but the large increase of lights has not yet yielded to the revenue as might have been expected." He regarded this statement as not very satisfactory.

The CHAIRMAN reminded Mr. Lovejoy that he had stated that the natives were only intermittent consumers.

Dr. BEATTIE said he had also been struck with the ambiguity of the paragraph referred to. If there was an extra consumption of gas, whether for one hour or six hours, there ought to be so much additional revenue. As to the leakage, was it not possible to do something to support the pipes at the joints? He understood that the pipes subsided at the junctions, and that much of the leakage was caused in this manner. What Mr. Lovejoy had said as to the reserve-fund was important, but if the fund was in their works he contended that it was really not a reserve-fund at all; and in this case, too, the dividend the Shareholders received was not only on the capital, but also on the reserve of £17,181.

Mr. R. H. JONES thought it matter of congratulation that the Directors should have renewed some of the debentures at 4½ per cent., as one ought to be very jealous of increasing the capital account. Notwithstanding the renewal of certain of the debentures, the capital account had increased by something like £5000; but if the Shareholders looked at what this additional sum had produced, it was certainly satisfactory, because if they turned to the accounts to the 30th of June, 1879, they would find that the gas-rental was something like 14¾ per cent. upon the share and debenture capital, whereas the gas-rental for the year to the 30th of June last was about 16 per cent. on the share and debenture capital. If they looked to the profit and loss account they also found the same satisfactory results. Taking the year 1878, the gas-rental was something like 198 per cent. upon the cost of the gas—he excluded the loss on exchange, because this was a matter over which the Board had no control; taking the year 1879, the gas-rental came up to 202 per cent. upon the cost; and taking the past year, it was 204 per cent. on the cost. He thought these were all very pleasing features in the report.

The CHAIRMAN, in reply, said that it was a fact that there was a large reserve-fund, and that it had been added to considerably this year; but the Shareholders must be aware the additional plant was a very large cost; there was also a considerable stock of coal on hand, and just now a quantity of 18-inch pipes was being replaced, at an expense of some hundreds of pounds. All this was paid for out of working capital, and it had prevented them calling for additional capital and paying 9 per cent. on it. By this the Directors had saved 4½ per cent. at least. As to the paragraph in the report which had been referred to, it should be remembered that the new contract had only been in operation since the 1st of May—two months to the date of the balance-sheet; but next year he believed that they would see a very large increase in the gas used by the natives. They did not use the gas directly it was laid on, being very economical; still, now that they had it, they would no doubt use it. As to supporting the pipes at the joints, so as to prevent leakage, the Directors found that when more weight was put under the soil, the more it subsided. Sometimes pipes had sunk, and it was not known what had become of them. All

kinds of things had been suggested to overcome the difficulty, but the Manager was well aware of the importance of this matter, and he (the Chairman) thought the Directors might leave him to adopt any means that his experience suggested to him to remedy this defect.

Mr. LOVEJOY said he could not concur in the Chairman's remarks as to the reserve-fund. It ought not to be used in support of capital, but be set aside to meet contingencies, not in laying pipes or doing anything substantial at the works.

The CHAIRMAN thought that these were contingencies.

Mr. JONES thought the matter might be met, if, instead of calling it a reserve-fund, they called it undivided profits. Practically this was what it was—not a reserve-fund.

Mr. H. M'LAUCHLAN BACKLER said the reserve-fund was an old subject between Mr. Lovejoy and himself. He agreed that the term "reserve-fund" was not perhaps a correct designation of the account as it stood, and probably it should be called "reserve account." It was not actually a fund, but it was fully represented by stocks, which amounted to £22,723, whereas the reserve account amounted to only £17,000 odd. Consequently, it was not actually sunk in the works, but was represented by coal, purifying materials, fittings, pipes, &c., and could be realized if the Company chose to raise capital for the purpose. The Directors, however, considered it was far better to employ the reserve in this way than place it in Consols or any other fund which would yield only 3 per cent. As to the unaccounted-for gas, he wished to say that it was not only leakage, but partly condensation, and the condensation of gas was greater in warm climates, such as that of Calcutta, than it would be in this country; so that there was no analogy between the two. The increase in the capital was owing principally to the new contract; and with regard to the paragraph in the report which had been criticized, he thought it would bear strict examination. It meant that all the new consumers, principally natives, added to the Company's rental, but had not yet become so thoroughly accustomed to the use of the gas as they would be in a short time, and that the Company had not yet realized all the revenue they eventually would from these lights.

Dr. BEATTIE contended that the observations of Mr. Backler were not satisfactory, because if a certain sum were annually taken away from the profits of the Company, placed to an account—no matter what it was called—and utilized as capital, there was then nothing invested. He would not invest the money in Consols, but there were many Colonial securities. He held the Company had nothing reserved to meet contingencies.

Mr. BACKLER, in further reply, said that if the Directors did what Dr. Beattie suggested they would not be in a position to pay the dividend they did on this occasion—they would have so much less to divide, because they would employ so much more share or debenture capital in the concern, instead of employing their own floating reserve account, which would then have to be represented by the interest they would receive upon it.

Mr. H. L. HAMMACK thought that Dr. Beattie's remarks would be perfectly pertinent if the Company had called up all their capital.

The motion was put and carried unanimously.

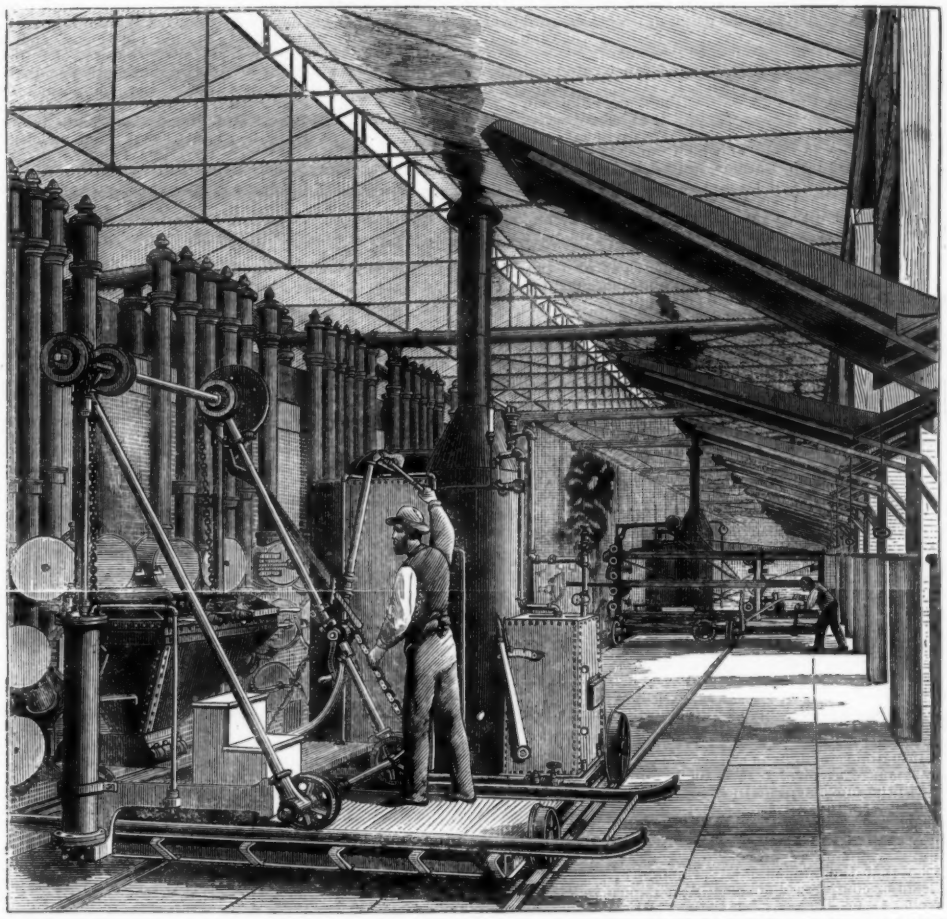
The retiring Directors and Auditors were then severally re-elected, and the dividends recommended in the report were declared. The appropriateness of increasing the remuneration of the Directors was discussed; but, on the motion of Mr. R. H. JONES, it was resolved—"That the remuneration of the Directors be considered at the next meeting of the Shareholders."

On the motion of the CHAIRMAN, seconded by Mr. GAREY, a vote of thanks was passed to the Calcutta Committee, to the Manager (Mr. Blackburn), and to the London staff.

Mr. HERSEE having acknowledged the compliment, a hearty vote of thanks was passed to the Chairman and Directors for their services.

To this the CHAIRMAN briefly responded, and the proceedings closed.

ROSS'S STEAM STOKER.



Among the papers read before the American Gaslight Association, at Chicago, Ill., last month, was one by General Hickenlooper, President of the Cincinnati Gaslight and Coke Company, on "Ross's Steam-Stoking Inventions, and the relation they bear to Gas Interests."

The paper commenced with the lament "that no manufacturing industry, of equal magnitude, inaugurated during the present century, has derived less aid from mechanical appliances than that of the manufacture of gas;" and proceeded to express the author's hope that, in the near future, the power which has "converted the low hum of the spinning-wheel into the music of a thousand spindles, or substituted the lightning-like flash of the locomotive for the lazy labouring of the rumbling coach" might "perform as great wonders for the gas producer." Descending from this "tall talk," General Hickenlooper gave a short account of the various appliances that have been introduced to lighten retort-house labour—from Maiben's horizontal rotary retort of 1814 to the most modern apparatus—concerning all of which he thinks there is "little room for surprise that so few should have proved of sufficient practical importance to attract general attention, or warrant words of hearty commendation." As to the "Ross Steam Stokers," the paper says they are "the results of four years of patient and undivided thought, study, and experiment upon the part of a man to whom the wide field of applied mechanics contains few untrodden paths. During this period many different machines were by him devised, built, practically tested, and finally abandoned as not fulfilling all the conditions which, in his judgment, were essential to complete success, leaving the ones which he now presents for the consideration of the gas world as the embodiment of all that was good or worth preserving out of the mass of accumulated information he thus obtained. As the duties assigned are essentially different, so also are the machines, which he has constructed separate and independent, in order that each may be made to perform its own work, in its own way, and upon its own schedule time."

The accompanying engraving is taken from a photograph of the machines as they appear in action at the works of the Cincinnati Gas Company, and the following description is from General Hickenlooper's paper:—

The discharging machine consists of a carriage or rectangular platform 14 feet in length by 8 feet in width, resting upon two longitudinal and five transverse wrought-iron 6-inch I-beams; the former 8 feet in length, two of the latter 13 ft. 3 in., and three 8 ft. 3 in. in length—all united by angle plates and rivets, forming a light and durable frame, carried upon four 24-inch flanged wheels, 4-inch face, and keyed to 2½ inch axles 9 ft. 2½ in. long, with bearing journals 2 in. by 6 in., moving upon an 8-foot gauge permanent trackway laid upon the retort-house floor, parallel to the face of the benches. Upon one side of this platform are located the boiler, with independent feeder, pop safety-valve, steam-gauge, &c., water-tank, and light direct-reversing propelling engine.

Located transversely across the other side is a rectangular frame, the horizontal braces of which are the guides for the reciprocating traveller. This frame consists of two vertical cast-iron columns bolted to the ends of the transverse platform beams, and having three wrought-iron pipe struts secured by 1-inch tie-rods passing through their centres.

The column nearest the bench is provided with guides for the reception and vertical play of a sliding box, which the operator can raise or lower

at will, and upon which are affixed grooved rollers and flat-faced wheels turning on studs to sustain and guide the rake-bars, any one of which can be clamped to the traveller or to the rear column when out of use. The traveller is a hollow cast-iron cross-head, riding between the guides, upon duplicate grooved friction rollers above and below.

The rakes are operated by means of a horizontal steam cylinder of 36-inch stroke, located parallel to, and on the right of the guides of the traveller. The piston-rod is attached to a cross-head moving in guides and carrying a toothed rack, which gears with a gun-metal pinion shrouded at either end, and thus gives an alternating rotary movement to the pinion-shaft journalled beneath the platform, upon which is keyed a drum carrying a chain, thence around grooved idler-rollers, turning upon studs secured at the sides of the front and rear columns respectively, and secured upon opposite sides to the traveller. By this means the reciprocation of the piston produces a corresponding movement of the traveller carrying the rake-bars, and by suitable adjusted hand-valve gearing the length and direction of the stroke can be varied by the operator at will. The speed of the traveller is governed by a water cylinder located on a prolongation of the line of the steam cylinder, and connected therewith by a solid piston. A pipe connects the opposite ends of this water chamber, through which the water displaced from one end is forced back into the other; the permitted rapidity of displacement being governed by the full-way cock placed thereon.

A special means of cushioning the impact at the end of the stroke is provided for by locating an air chamber beyond the displacement port, into which the water is forced. This chamber is provided with an automatically acting air-valve, which closes upwards as soon as the water commences to rise in the chamber, and opens as soon as the pressure of air in the chamber equals that of the atmosphere. These governing devices are supplemented by rubber buffer-springs on the traveller.

The rake-beams are of rolled angle iron 4½ in. by 1½ in. by 11-16ths in., tapering from rear to front. The rake-heads are steel castings of any shape suited to the size of the retort, hinged to the ends of the rake-beams by rule-joints, which permit them to turn freely under the beams, should they meet with any obstruction while being projected forward over the coke into the retort, and to assume a vertical position when brought into contact with the charge during the outward movement.

The whole machine weighs about 7000 lbs., and can be at once introduced into any existing retort-house having not less than 18 feet of space between the mouthpieces and the side wall, without any change or preparation other than laying the track upon which it is to be moved.

The charging machine consists of a rectangular carriage 10 feet in length by 9 feet in width, the framing of which consists of two longitudinal and four transverse 6-inch I-beams, united by angle plates and rivets, and mounted on two pairs of track-wheels 12 and 24 inches in diameter, keyed to 2½-inch axles. Upon one side of the platform covering this framing are located the boiler, steam reservoir, water-tank, and propelling engine. On the other portion is mounted the supplemental carriage carrying the coal-hopper, together with the devices for elevating and depressing it. The steam boiler and attachments, as also the propelling engine, are duplicates of the ones on the discharging machine.

The steam reservoir is a vertical cylinder 6 feet high by 2½ feet in diameter, the space between it and the boiler being occupied by the water-tank. The supplemental carriage consists of two triangular supporting frames of wrought-iron pipe, rising about 10 feet above a square base, mounted upon track wheels arranged to run upon rails laid upon the main platform, and upon which it is moved to and fro, by hand windlass and chain connection. Across the top of this frame is journalled a horizontal shaft, which also forms the top brace of the supplemental carriage. The side brace also forms guides for the hopper, which, being loosely adjusted, admits of a free vibration. The hopper is suspended between the two side frames by chains winding upon sheaves keyed to the shaft above, upon the projecting ends of which shaft are secured at one end a brake-wheel and at the other a sheave, having thereon a winding chain attached at its free end to the piston-rod of an upright cylinder, secured upon the platform of the supplemental carriage, and against the vertical brace of the adjacent triangular frame. This cylinder is single-acting, and as its chain winds in the opposite direction from those supporting the hopper, it operates directly against the weight of the hopper and its contents. Steam is supplied to the cylinder through a swivel-jointed pipe, which having a three-way cock answers also for an exhaust. This elevating mechanism and attached brake-wheel enable the operator to instantly adjust the coal hopper to any desired height.

The hopper is a funnel-shaped sheet-iron vessel, divided by vertical partitions into three compartments, each containing sufficient coal for one charge. These partition plates are so hinged at their upper edges that the coal contained in each compartment can be alternately discharged into the conduit below. In the rear of this conduit is located a pipe with a series of jet nozzles horizontally disposed, so as to discharge against the coal and thus project it into the retort. The connection is made between the conduit and the dry steam reservoir, by a swivel-jointed copper pipe which accommodates itself to the movement of the supplemental carriage. The discharge is effected by opening a Wilson or other quick-opening valve, located near the steam reservoir, which with the lever of the propelling engine, the three-way cock of the hoisting cylinder, and the brake lever, are all located within convenient reach of the operator.

It will thus be seen that the fundamental principle of this system of charging is a dry steam or compressed air blast, used explosively, in direct contact with the charge of coal, without the intervention of any mechanical appliances. The mechanism otherwise employed is of the most simple and durable character, enabling a single operator, by the exercise of ordinary skill, and with but trifling personal exertion, to control every movement necessary to the successful operation of each machine.

In the practical operation of these machines at the works of the Cincinnati Gaslight and Coke Company, an attendant strikes the lids from three retorts, or one-half of a bench; the discharging machine is then brought into position opposite the upper retort, with the corresponding rake pinned to the traveller, when the operator with his right hand on the lever used for controlling the vertical play of the rakes, and his left upon the valve lever of the steam cylinder actuating the traveller, elevates the guide-bar to admit the rake-head into the retort above the charge; and as the rake is projected forward, should it meet with any obstruction, it folds back under the rake-beam, and again assumes a vertical position when the obstruction is passed or the withdrawal begins. His position is at such a distance from the mouthpiece that it gives him every opportunity for observation, unembarrassed by the heat or smoke arising from the expelled coke, and the thrust being governed by the automatic devices before referred to, his entire attention can be centred upon the direction of the movement and the vertical adjustment, perfectly governed by the two levers under his immediate control, enabling him to arrest, renew, or reverse the movement, or to elevate or depress the rake-head at any desired point. The tar-cake is first removed by a short stroke, followed by such other movements—usually from four to six—as may be found necessary to clear the retort; the whole occupying not exceeding fifteen seconds. The rake-beam is then detached from the traveller and pinned to the column, the next lower one shifted into position, and the discharging operation repeated.

The discharging machine is closely followed by the charger, which, having been coaled by shoots leading from the bins conveniently located along the side of the retort-house, is moved into position opposite to, and in a vertical line with the lower or first retort to be charged. The operator then runs forward the supplemental carriage by its hand-propelling windlass until the guide-flange of the conduit enters the mouthpiece, and effects a discharge by three or four quick openings of the Wilson valve, so graduated that the first blast will project a portion of the charge to the rear of the retort, the succeeding blasts depositing their charge uniformly in front of it. [The skill necessary to do this perfectly can be acquired by any intelligent workman in a few hours.] The hopper is then moved back a few inches, and the main carriage run to one side far enough to allow the lid to be closed by an attendant in the usual manner. While this is being done, the hopper is being elevated to the level of the next retort, where it is held by the brake before referred to, the partition plate sprung open, admitting coal to the conduit from one of the other compartments, the machine moved into position in front of the next retort, the secondary carriage moved forward, the valve opened, and the retort charged as before, which operation occupies about six seconds from the adjustment of the conduit to the mouth of the retort, until the whole charge is deposited. After three retorts have been thus charged, the hopper is lowered, drawn back upon the supplemental carriage to its limit of travel, the machine propelled to the nearest coal shoot, and the hopper filled as before.

This process is repeated as often as desired, or to the limit of the working capacity of the machine, which, including re-coaling, &c., will, with one operator and one assistant to each machine, average over 60 retorts per hour. Out of this a certain amount of time must necessarily be allowed for rest of operator, replenishing fire, watering, oiling, &c. At our works a pair of machines have, with apparent ease, drawn and charged 27 benches, or 162 retorts, which, with four-hour charges, gives 40 minutes work and 20 minutes rest.

The guaranteed capacity of the machines—one retort per minute—appears to make it unnecessary for me to enter into very accurate detailed estimate of the saving due to the introduction of such a system, for this must, to a great extent, depend upon the cost of retort-house labour in any works with which it is desired to institute a comparison. I will, however, submit a few facts and figures, based upon our own experience, in order that you may at least be able to form an approximate estimate of the pecuniary advantages attending their introduction.

In fairly considering this subject, it must not be forgotten that many of the changes which it appears advisable to make, in order that the best possible results may be obtained, carry with them their own attendant advantages, and should not, therefore, be taken into consideration unless placed to the credit of machine labour. Take, for example, the handling of the coal, which, by the aid of suitable mechanical appliances, can be prepared, elevated, stored in bins, and run into the hopper of the machine at much less expense than is now required to place it on the retort-house floor by manual labour; and if, as should always be the case, this storeage capacity is in excess of the daily demand, night-work—always the most expensive—can be entirely dispensed with, and a constant supply of dry coal be kept conveniently near. The discharged coke can be disposed of in exactly the same manner as if drawn by hand, which makes it unnecessary to introduce the cost of delivering coal and removing coke in any statement of comparative cost. No very accurate estimate can as yet be made of the depreciation and cost of repairs, but certain it is that the latter will be much less than the sum now expended in repairing and renewing retort-house tools, and will not, therefore, be included in the estimate.

The maximum working capacity of one pair of these machines can be fairly fixed at 30 benches, or 180 retorts, which gives 45 minutes work and 15 minutes rest, and the operation of which will be covered by the following estimated expense:—

	Dols.	c.
Interest on investment, say, 10,000 dols., at 6 per cent.	600	00
Depreciation, say, 10,000 dols., at 10 per cent.	1,000	00
Engineers (two day and two night), four, 365 days, at 2.50 dols.	3,650	00
Assistants (one day and one night), two, 365 days, at 1.75 dols.	1,277	50
Lid-men (two day and two night), four, 365 days, at 1.50 dols.	2,190	00
Firemen (five day and five night), ten, 365 days, at 2.00 dols.	7,300	00
Fuel—Coke, 30,000 bushels, at 4 cents.	1,200	00
Water—City, 700,000 gallons, at 10 cents.	70	00
Oils—Cylinder, 62 gallons, at 80 cents.	49	60
" Lubricating, 62 gallons, at 25 cents.	15	50
" Illuminating, 40 gallons, at 20 cents.	8	00
Packing, 30 lbs., at 1 dol.	30	00
Cotton waste, 100 lbs., at 10 cents.	10	00
Men, 20; cost	17,400	60

Producing 20,491,830 cubic feet per man, at an expense of 4¼ cents. per 1000 feet.

To perform this same service under the present system of retort-house labour (four men to five benches) requires the services of 48 men (24 day and 24 night) for 365 days, at 2.50 dols. = 43,800 dols.; producing 8,538,242 cubic feet per man, at an expense of 10·68 cents. per 1000 cubic feet, showing a saving of 26,600 dols. per annum on one pair of machines, or 6·43 cents. per 1000 cubic feet manufactured.

THE UTILIZATION OF RESIDUAL GAS PRODUCTS.

At the Meeting of the Manchester Scientific and Mechanical Society, held on Friday last—Mr. CORBETT in the chair—a paper on "The Utilization of Residual Gas Products" was read by Mr. G. E. DAVIS, F.C.S., F.R.M.S.

In his paper Mr. Davis said that illuminating gas, as his hearers were aware, was produced by the destructive distillation of coal; the coal was split up into gas, ammoniacal liquor, and tar, which were separated by appropriate means. The amount of these products varied very considerably; but if he quoted some figures of Mr. Charles Hunt, of the Birmingham Corporation Gas-Works, he knew he should not be very far wrong. Mr. Hunt gave an example of Newcastle coal carbonized in London as yielding 10,500 cubic feet of gas per ton, with 10 gallons of tar, and 22·5 gallons of ammoniacal liquor of 4·5° Twaddel. The sulphuretted hydrogen abstracted from the crude gas was 7·06 lbs. per ton, the carbonic acid 30·6 lbs. per ton, and the coke produced 1560 lbs. A sample of inland gas coal produced but 9400 feet per ton, yielded 11 gallons of tar, and 31 gallons of ammoniacal liquor of 5° Twaddel. The sulphuretted hydrogen taken out was 12·6 lbs. per ton, and the carbonic acid removed was 27·7 lbs. over and above that present in the ammoniacal liquor, whilst the coke weighed 1500 lbs. A third sample of inland coal yielded 8300 cubic feet of gas per ton, gave 11 gallons of tar, 20 gallons of ammoniacal liquor of 5° Twaddel,

11·2 lbs. of sulphuretted hydrogen, which also abstracted 24 lbs. of carbonic acid, leaving 1500 lbs. of coke in the retorts. The quality of the gas itself, and also of the bye-products, was greatly influenced by the heat and other manipulation in the retort, and it had been found possible in separate works—say a small one and a large one—to produce from the same coal, in the former 9400 feet of 16½-candle gas, while the latter produced fully 11,000 feet of 17-candle gas. The coal having been resolved into the above constituents, these had to be dealt with. The gas, with a little enclosed air and carbonic acid sometimes, was sent through the gas-meters; the coke, which amounted to about three-fifths of the original coal distilled, was partly employed for firing the retorts in the manufacture, and the remainder was sold. In his opinion, if the gas companies would break the coke into small pieces, it would be much more applicable to house-fires than at present. The sulphuretted hydrogen, which was removed from the crude gas by means of the purifiers, was at one time entirely wasted on account of its being combined with lime, but now nearly the whole of the coal gas in this country was purified by means of oxide of iron, which retained the sulphur in the free state, and from which it could be burnt. The oxide of iron, when it became completely charged with sulphur, contained from 40 to 60 per cent. of that substance, and was sold to the vitriol maker, who used it in the place of brimstone. This oxide was liable to become charged with lime during its manipulation at the gas-works, and this lime was extremely detrimental to the vitriol maker, by preventing the sulphur being completely driven off, and this was a subject on which he had, on two different occasions, called the attention of manufacturers. The sulphur in spent oxide was worth about 4d. per unit per ton to the manufacturer at his works. The only correct method of analysis and valuation, however, was by the combustion test, and he was sorry to say that since giving up practice no one had worked it so continuously and persistently as he had done himself. He now came to the ammoniacal liquor, of which about 20 gallons of 5° Twaddel was obtained on an average from each ton of coal. This liquor was mainly sold to the ammonia makers, who often worked it at a distance, and paid enormous sums for carriage; but several gas companies now made it themselves into sulphate of ammonia, and so reaped all the possible benefits. There was oftentimes great injustice done to the purchasers of ammoniacal liquor, the sellers generally stipulating that all tenders should be expressed at so much per ton, or so much per 100 gallons, per degree Twaddel, they knowing well enough they were on the right side; and so, in order to increase their revenue, they crowded all the impurities they could into the liquor. But this was sharp practice, and he was not sure that the gas companies gained by it in the long run. There now remained only the tar to dispose of, and this was universally sent to the tar distiller, who extracted the light and valuable oils from the heavier and almost worthless pitch. The tar was valuable to the distiller on account of the presence of the following substances—viz., crude naphtha, light oil, burning and solvent naphthas, anthracene, grease, oils, and pitch. The constituents of tar varied very much according to the kind of coal carbonized, some varieties containing a maximum of crude naphthas and a minimum of anthracene, whilst others were just the reverse, and, of course, the value of the tar must vary with the amounts of these constituents. This being the case, he hoped they would see how unjust it was on the part of gas companies to alter the mode of manufacture, the coal, or the method of purification during the term when they were under contract to supply any manufacturer with their residual products. After going into details with regard to the method adopted in the treatment of tar when it came into the hands of the manufacturer, Mr. Davis, in conclusion, asked what would happen to the vast industry which was connected with the manufacture of gas, if the electric light took the place of gas. And the answer he gave was, Simply nothing. There would spring up, near the coal-pit banks, distillers of coal merely—manufacturers who would distil coal at a low temperature in order to produce tar, and they would call the gas a bye-product. They would get all the ammoniacal liquor at present obtained, say 20 gallons of liquor, of 5° Twaddel, per ton of coal, and instead of 11 gallons of tar they would get probably 30 or 40 gallons. He could not, he was sorry to say, give any figures in justification of his theory on this point, as it was many years since such a scheme was tried, and then tar was rather a drug in the market. They would, however, know the money which had been made in this direction by the distillation of shale; but he did not wish them to regard him as a prophet, because he now told them that immense sums would be made some day solely by the distillation of coal.

The Chairman said the immense developments which had taken place during recent years in the utilization of the waste products of gas manufacture must be patent to every one, but with regard to the electric light superseding gas, he thought there would always be plenty of scope left for gas. For many purposes to which it was at present applied gas might probably be superseded, but new uses would be found which would make it just as much required as it was at present; whilst they might find so many new channels for what were now termed the waste products, that gas itself might eventually become the real bye-product.

Mr. Heys said even if electricity were adopted for illuminating purposes, quite as much gas as at present would be required, and its application would be largely developed for cooking and mechanical purposes.

Mr. Davis having replied to the remarks made upon his paper, the proceedings closed with the usual vote of thanks.

The Gas Lighted Buoy on the Roseneath Patch.—The gas buoy with which experiments have been made for some time past on the shoals off Kilcreggan shore has proved such a success, that a similar buoy is to be laid down at Garvel Point, in the estuary of the Clyde.

The Price of Gas in Paris.—It may be remembered that early in the present year the French Minister of the Interior nominated, upon the requisition of the Municipal Council of Paris, a Commission to inquire into the subject of the gas supply of the city, with the object of obtaining from the Paris Gas Company some reduction in price. The action of the Municipality was prompted by the receipt of a number of memorials, on the subject of the price of gas, from several of the Syndical Chambers of Commerce, who contended that the improved systems of gas manufacture now in general use, together with the increased value of residuals, enabled companies to supply it at a much cheaper rate than hitherto, and they urged the Council to institute an inquiry as to whether these improvements had been adopted by the Paris Gas Company, and if so whether the City would not therefore be justified in asking for some reduction to be made in the price charged for gas. The Commission above referred to reported that the City would have no right to demand a reduction in price on the ground stated. However, the Council have themselves appointed a Committee on this subject, and they, attended by the Municipal Engineers, will shortly meet the representatives of the Gas Company, with the object of discussing the bases of a new convention. It seems that the Company are not at all indisposed to lower their charge for gas from 30 c. to 20 c. per cubic mètre, which would be equal to a reduction of about 2s. 3d. per 1000 feet; but for this substantial benefit conferred upon the City generally the Company would expect, and justly, some slight return, in the shape of a prolongation of their concession beyond the limit fixed by the treaty of 1870.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

Edinburgh, *Saturday*.

The month of October and a portion of November will long live in the recollection of Scotchmen as being both exceptional and peculiar in the history of the country. From one cause or another, but mainly owing to the dryness of the weather, complaints have been heard of scarcity of water from Greenock to Thurso, and considerable loss and suffering have been the inevitable results. Happily for Edinburgh, the citizens have had no cause to grumble on the score that their water was not sure, and for such as it is the community have been thankful. The Edinburgh supply has, as the readers of the Journal may be aware, been greatly increased within the past year or two. This addition was the result of an agitation which, while it continued, stirred the community to the heart, roused in an unwonted degree the interest of the inhabitants, and occasioned the expenditure of larger sums of money, both on the part of the Corporation and its opponents, than have ever yet come to the knowledge of the public. St. Mary's Loch, some 40 miles from the city, and over which the halo of poesy has been flung by the "Wizard of the North," and near to which the Ettrick Shepherd dreamed those quaint poetical productions which have enriched the literature of his country, was the place selected as the future water store of Edinburgh; but the absurd pictures drawn of insects which were said almost to thicken the water of the Loch, turned the minds, if not the stomachs, of our legislators at Westminster, and the city was consequently compelled to turn its attention to one or other of the many spots, within easy reach, whence an abundant supply might be drawn. Undoubtedly more water was essentially necessary, and as the people had been so accustomed to the beautiful crystal-like water from the Crawley springs, they were, perhaps, a little fastidious in selecting a site. And what has been the result? They have now introduced a supply which has been described as "dear, dirty, and dangerous." From peaty gathering-grounds in the uplands of Peeblesshire large volumes of water are collected and conveyed to an immense reservoir at Alnwickhill, just beyond the village of Liberton, and at such a height above the topmost habitable point of the city as to admit of a sufficient pressure. Here the water is passed through a number of filter-beds 6 feet deep, and is then drawn into cooling-tanks. But, despite all the trouble and expense that the process of purification and cooling costs, the water retains its brownish, washed-out porter colour, to such a degree that the authorities have not dared to send a gallon of it unmixed into the city. In fact, at a recent meeting of the Edinburgh and District Water Trust, one of the members suggested that one week's supply of Gladhouse water pure and unmixed should be sent into the city as the fairest way of enabling the inhabitants to judge of its quality; whereupon the worthy Treasurer of the City in horror exclaimed: "We should be all poisoned off, I suppose, and there would be no more trouble." In order to make the water as attractive-looking as possible, the authorities mix the peaty supply from Gladhouse and the crystal-like waters of the Pentlands at the Alnwickhill reservoir, and then treat their constituents to the blend. Considering the enormous sums which have been spent in introducing this additional supply to Edinburgh, it is anything but satisfactory that it should be of such an inferior description. While many of the inhabitants would not care exactly to see our civic rulers poisoned, there are others who would unhesitatingly condemn them to a regimen of Gladhouse water for the remainder of their existence, as a warning and an example to succeeding Councillors.

The Shareholders of the Dundee Water Company have now received the last copper to which they are entitled. A good long time ago a payment of 1s. 5d. per share was made to each Shareholder, which required £1140 8s. 4d. A final dividend of 1d. in the pound has been paid, and this may be said to be the last act of the Dundee Water Company. Of course, the supply is now in the hands of the town.

Ten years ago the Police Commissioners of Broughty Ferry, near Dundee, acquired the property of the gas-works from the town, and since then the manufacture and sale of gas have gone on steadily increasing. At the outset of their career the Commissioners were making only the modest quantity of 9 million cubic feet a year, but after the experience of a decade they are now making 19 millions, or an average increase of 1 million cubic feet every year. This is encouraging. Of course, this large increase in the make of gas has necessitated many extensions and renewals, and these have been made from time to time. Not very long ago the Commissioners borrowed £6000, a third of which amount has just been expended in further extensions and improvements. Besides enlarging the retort-house, nine new retorts have been put in, an engine has been erected to work an exhauster, and to pump tar direct from the works to a cistern at the railway capable of holding 2500 gallons. Tank waggons are now employed to take the tar to the distillery, so that in the item of cartage alone the Commissioners are bound to experience a considerable saving when the next balance-sheet comes to be made up. In addition to these improvements the condenser-pipes have been enlarged; and one of Anderson's patent brush scrubbers and two purifiers have been introduced. The result of these alterations and improvements is already apparent in the quality of the gas supplied, which is now of 28-candle power, and sold at 4s. 2d. per 1000 cubic feet. The works are under the management of Mr. Myers, whose son, Mr. John Myers, recently obtained the appointment of Manager of the gas-works at Kingsbridge, in South Devon.

(FROM OUR GLASGOW CORRESPONDENT.)

Glasgow, *Saturday*.

The movement for the adoption of the Burghs Gas Supply (Scotland) Act has met with two checks during the past week. In both cases the frustration of the efforts to adopt the Act has been closely connected with the reconstitution of the municipal bodies in which the "gas question" was playing a prominent part. The first case which I may mention is that of Helensburgh, the Police Commissioners of which resolved, on the 9th of September last, to adopt and apply the Act to that burgh. When the Commissioners met last Monday to resume consideration of the resolution formerly agreed to, the opposition came chiefly from a determined opponent of the Chief Magistrate (Provost Stuart), in the person of Mr. Dingwall. This gentleman was strong on the question of the electric light interfering with the large consumption of gas. He also went into the question of "ways and means," and referred to several towns where the gas supply undertakings had become the property of the municipal authorities. Comparing the price of gas supplied by corporations and that of gas supplied by gas companies, he stated that the average charge in the former case was 5s. 5d. per 1000 cubic feet, as against 4s. 10d. in the latter. Bailie Forsyth, owing to the fact that he was a Shareholder in the Helensburgh Gas Company, preferred to refrain from giving his opinion on the matter under consideration, but after the Town Clerk had said that there was nothing in the Act to prevent speaking or voting on the question, he said that he highly approved of the object of the meeting, and that he was in favour of the Gas Act being adopted, as he thought it would be beneficial to the ratepayers. Another member, who had moved the adoption of the Act on

the former occasion, withdrew his support from the resolution on the second occasion. His chief difficulty now seemed to be the electric light, which, from what he had read, heard, and seen, he believed was making great strides towards perfection; indeed, he thought it was possible that it might be the light of the future. Mr. Muir was of opinion that it would be an advantage to the ratepayers if they had the control of the gas in their own hands; but of course he also was troubled with the bugbear of the electric light, and he thought it would be the height of folly for them to give, say, £30,000 for old gas-works that might in a few years be perfectly worthless to them. Other speakers urged that there should be some delay before finally adopting the Act. At the close of the discussion, the Provost moved that the meeting be adjourned for a month, and that in the meantime a Committee be appointed to make such inquiries as they might deem necessary, and report to the Commission on the adoption of the Act. The motion was seconded, and an amendment was then submitted to the effect that the meeting should come to a decision that night, and resolve that the Act be not adopted. Six members voted for each proposition, when the Provost declared the amendment to be carried, as the Act provided that two-thirds of the members present must be in favour of it before it could be adopted.

The other case was that of the Burgh Commissioners of Kilsyth, who also met last Monday to resume consideration of their resolution, come to on the 19th of August, to adopt the Act. In the course of the discussion which took place on the subject, the electric light again played a prominent part, and eventually it was resolved to adopt a proposal by Bailie Hamilton to postpone the further consideration of the subject for six months.

At a recent meeting of the Directors of the Callander Gaslight Company it was unanimously agreed to reduce the price of gas from 7s. 6d. to 6s. 8d. per 1000 cubic feet. In consequence of the many additions to, and great alterations made upon the gas-works this year, the quality of the gas has become most excellent, and the productive power of the works is now, it is thought, such as to supply Callander with gas for the next 15 years, even though the burgh should increase in size in the same ratio as it has done during the past 15 years.

Business was done in the Glasgow Corporation 9 per cent. Gas Annuities at £223 10s., both on Wednesday and Thursday, and yesterday the Corporation 4 per cent. Water Annuities were asked for at £104, being an advance of 10s.

The water supply question is giving a great deal of anxiety to the people of Stevenston and Saltcoats, neighbouring towns on the Ayrshire coast. After discussing it at an open meeting of the Local Authority held lately, and considering whether or not a supply should be obtained from the Irvine Authorities, the whole subject was remitted to a large Committee.

It has been resolved by the Police Commissioners of Maybole to provide a new water supply for the town, at a cost of probably fully £5000, for a scheme recommended by Mr. J. M. Gale, C.E., of Glasgow. They have been stimulated to this action by the Board of Supervision, on the advice of their Medical Officer, Dr. Littlejohn.

A water supply scheme for Kilcreggan, one of the summer residential towns on the Firth of Clyde, is now receiving attention from the Police Commissioners and ratepayers. The district is comprised within the Roseneath Estate of the Duke of Argyll.

The Paisley Water Commissioners have unanimously resolved on going to Parliament for powers to carry out a great water supply scheme, the source being in the Ayrshire Hills, near Dalry, the probable cost being estimated at £100,000.

There has been a marked degree of steadiness in the Glasgow pig iron warrant market during the past week, and a good business has been done daily. The close yesterday was 52s. 6d. cash, and 52s. 7d. one month for buyers, and sellers asking 1d. more per ton.

The coal trade is decidedly improving, more especially in the demand for house supplies.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the *American Gaslight Journal.*]

(*Continued from p.* 818.)

After the reading of Mr. T. Forstall's paper, on "Stoppages in Ascension-Pipes," published last week, the following discussion took place:—

The PRESIDENT said the paper was a very able and interesting one, and invited the most careful scrutiny and thorough discussion.

Mr. WOOD, alluding to the paper read by his son before the Central New York Gaslight Association, and to which reference had been made by Mr. Forstall, said that paper was written some seven months after they began the use of water internally applied to the stand-pipes; and the experience narrated in the paper had been continued since—instead of having over a thousand stopped stand-pipes in sixty days, they had not had five in a twelvemonth. He thought the great trouble with Mr. Forstall was that he used too much water. It required only very little—just the continuous dropping of water, no more.

Mr. FORSTALL said they graduated the quantity very carefully; beginning with a little, and slowly increasing the amount.

Mr. WOOD said they had not had any broken mouthpieces, no broken stand-pipes, nor any results of that kind. Care was taken after the charge was drawn from the retort, and before putting in another charge, to clean out—with a tool made expressly for the purpose, as related in his son's paper—the mouth of the stand-pipe, as it was at this point only that any stoppage occurred—just as the stand-pipe left the mouthpiece. He did not think in works where this was done there would be a single stopped stand-pipe. At Syracuse they ran their heats as high as possible. Their retorts were 12 in. by 23 in. and 9 ft. long; and they carbonized in each from 1600 to 2000 lbs. of coal every 24 hours. In the building of their present retort stacks they added the half brick to the front of the bench, as described by Mr. Forstall, making it a brick and a half, and leaving a ½-inch air space. The stand and bridge pipes were cooler by reason of this additional half brick and the air space between. They had also put up shields of iron plates. If, however, these were introduced, on the inside only of the ascension-pipes, the small quantity of water that he had referred to—just a continuous dropping— it would be found that the water, converted into steam, kept the whole thing moist. The moment the retort-lid was slacked off the water would be seen dropping down in the mouthpiece. He did not formerly experience any difference, such as was mentioned in the paper, between the stoppages in winter and summer; but now he did not have five stand-pipes stopped in a twelvemonth.

Mr. STARR asked the size of Mr. Wood's stand-pipes.

Mr. WOOD said they were 6-inch pipes. Continuing, he said that with the application of water, as he recommended, it would be found that there was a collection of dry carbon around the inside of the mouthpiece, just by the stand-pipe. It would be pretty hard at times, but not hard enough to necessitate slacking off the lid to clear it away.

Mr. FORSTALL said he hoped Mr. Wood did not think that he doubted at all, but that the result in his works had been precisely as stated. He merely believed that the good results in his works were brought about, not by cooling the stand-pipe, but that indirectly, by cooling the ascension-pipe, he cooled the mouthpiece, and that the cooling or non-cooling of the ascension-pipes had nothing to do directly with the result. The experiment in his (Mr. Forstall's) works had been tried exactly as Mr. Wood tried it. They used the water-jets after a fashion of their own. After reading Mr. Wood's paper, he took pains, in order that there might be no question as to the manner in which the water had been applied, to exactly follow Mr. Wood's directions; and he could assure the meeting that the failure in their case had not resulted from any careless use of the prescription. He did what he always did when he called in a physician—exactly what he was told to do; but in this case the symptoms were not at all relieved. He attributed this failure to the fact that possibly their heats approached the mouthpiece a little nearer than they did in Mr. Wood's works. The mouthpieces being rather shallow, there was very little space between the stand-pipe and the brickwork. So that he supposed in his case the indirect action upon the mouthpiece was not sufficient. It was then that he tried the experiment of turning on more water. The consequence was that the bridge-pipes and the dip-pipes were stopped; also the portion of the ascension-pipe directly above the jet of water. He asked whether Mr. Wood had any stoppages in the dip-pipes in his works.

Mr. WOOD said he had not.

Mr. FORSTALL: Do you have any pitch in your hydraulic main?

Mr. WOOD: None at all.

Mr. FORSTALL said at his works they had very thick tar, and often even pitch, although their main was pretty well elevated above the bench.

Mr. WOOD said his main was about 3 feet above the retort-bench; and was cool enough to bear a hand being placed upon it. They had very thick tar in the main, which troubled them somewhat at times to carry it off by the tar-well; they had no trouble, however, and no stoppage in the dip-pipes. Sometimes when they slacked a retort-lid off there would be running down the mouthpiece quite a quantity of moist thick tar, which needed scraping off.

Major DRESSER asked what was the character of the stoppage when one was found.

Mr. WOOD said it was usually very hard, dry carbon, burned on to the inside of the mouthpiece and at the entrance to the stand-pipe. His mouthpieces were about the usual depth—12 inches—and the stand-pipes 5 or 6 inches.

The PRESIDENT said that perhaps the different coals used might help to explain the difficulty.

Mr. FORSTALL: We use Penn or Pittsburgh coal.

Mr. WOOD: We use Youghiogheny and Westmoreland Pittsburgh coal.

The PRESIDENT said he made the remark because he had attempted to use a certain coal that was thought might perhaps prove to be good gas coal. He knew it was rich in gas, and thought it might turn out to be very good and cheap; but instead of distilling tar it distilled pitch, and stopped everything. They were obliged to discontinue using it, because it stopped up everything. It might be that sometimes the difficulty spoken of arose from the use of coal that of itself had a tendency to produce pitch.

Mr. WOOD said both he and Mr. Forstall were using about the same kind of coal. Mr. Forstall spoke about the heat coming out of the front of the bench. The setting that he (Mr. Wood) used was an open setting, one of his own device, and perhaps a little peculiar, but not differing very much from the ordinary open setting. With this setting they heated their retorts well up to the mouthpiece, and it was quite a relief to the men from the heat in charging, especially in the summer-time, when he added the brick and the ½-inch air space he previously mentioned. His benches were well heated out to the front, and with his setting he could not observe any difference in the stand-pipes as between the lower and upper retorts. He did not have the experience that Mr. Forstall related. His retorts faced to the east, and this might make a difference.

Mr. FORSTALL said the prevailing wind might have something to do with it, as well as the direction in which the retorts faced. He had an extra thickness of wall—13½ inches—but he had not put in sheet iron between the brickwork and the stand-pipe; which might help to prevent radiation to the mouthpiece. When he spoke of heat coming forward on the mouthpiece, he referred to radiation. In Mr. Wood's case the mouthpiece might be kept cooler by preventing the transmission of heat from the brickwork. The ascension-pipes that he used were 14 ft. 10 in. long. He had added several feet to their original length, and had since that time kept down the heat of the pipes.

Mr. WOOD said there was one thing that had aided somewhat in keeping the thick tar or pitch from their main, and perhaps from the bridge and dip pipes. He did not know what the experience of others might have been in this direction; but in resetting his benches—he had two sets of seven benches each—he used up one bench entirely, or calculated to, before repairing it. At that time they took off the end plates from the main, and the stoppers out of the stand, bridge, and dip pipes, and gave them a thorough cleaning.

Mr. FORSTALL said he had this done every Sunday. The hydraulic main was cleaned out from one end to the other, as well as every stand, bridge, and dip pipe regularly. The Sunday work of cleaning out these stoppages was not included in the figures he had given. It was only the stoppages between times that he had made a record of. In the old retort-house the hydraulic main was laid close to the brickwork, and the coarse cinders were nearly on a level with it. The bricks were almost red hot, and it was impossible for a man to walk on them; but the main was free from pitch. There was no thick tar in the main, nor a stopped bridge-pipe, nor a stopped dip-pipe, nor delay on account of a stopped ascension-pipe, and it was possible that in this direction might be found the cause of the stoppages.

Mr. WOOD said he had perhaps a greater thickness of brickwork on top of the retorts, and between them and the hydraulic main, than Mr. Forstall had mentioned. It was seldom that they were red hot. They never got so hot as Mr. Forstall stated his did.

Mr. FORSTALL said the retorts he referred to were the old benches; in his new benches they had 3 feet of brickwork above the retorts, and a man could walk on the bricks without any inconvenience at all.

Mr. LUDLAM asked Mr. Forstall if he ever tried putting a vessel of water in the mouthpiece.

Mr. FORSTALL said he had done so. As far back as 1871 he used a patent lid, invented by a Mr. Jones, of South Boston. It was a casting with a cup on the inside for holding water. In those days, however, the stoppages were so few that they had no object in adopting any special means for preventing them. After changes in the retort-house they tried a similar plan, but did not find relief from it. He had used all sorts of vessels, from one gallon up to five, but had not derived any apparent benefit from them. The trouble was that wherever there was any benefit immediately due to the use of water, the stoppages would all take place beyond the point where it would be effective. In some cases it was quite possible that a vessel of water would do good, and afford relief, but it did not in his case.

Mr. STARR asked if the difficulty would not be obviated by the use of large stand-pipes. In his own case he first put in 4-inch stand and bridge pipes. They used to stop frequently, and he had a great deal of trouble with them. Sometimes they had to take off the lids and clean them out, and sometimes he had to burn them out. The next season he put in 7-inch

stand-pipes, and after this he had very little trouble. He was now using 8-inch stand-pipes and 7-inch dip-pipes, and they had not been stopped more than perhaps two or three times in two or three years. He credited his freedom from stoppages to using small stand-pipes. He did not think that anything less than 8-inch ones should be used.

Mr. Wood said he did not think that large stand-pipes would remedy the difficulty. He commenced running higher heats, getting present results while having an old 14-inch hydraulic main. The stand-pipes started from the mouthpiece at 4 inches, and ended at the hydraulic main at 8 inches. In rebuilding one set of benches, he put in a larger main and 6-inch stand-pipes, and expected immediate relief, but had none. He had had, with 6-inch stand-pipes, about the same experience that Mr. Forstall had detailed in his paper; and fully as much trouble with them as with smaller ones. There was no question but that with high heats there would be stopped stand-pipes, and a superintendent or engineer of gas-works who boasted of having no stopped stand-pipes could be pretty well assured that he was running low heats.

Mr. Helme said a few years ago he was in Dumfries, and saw Mr. Malam's process in operation, and although he had such high heats he had no trouble from stopped pipes.

Mr. Somerville said a few days previously he had in his works something which was very unusual with him—a stopped pipe. He told the men to shovel cold coal for a little while on the floor of the mouthpiece, as his idea was that cold coal would cool the ascending vapours. It always had had the effect in his case of clearing the pipes.

Mr. Forstall said he had tried the plan, and it was almost invariably successful, of putting the last shovelful of coal in the mouthpiece. But it was a costly remedy, and one that he did not like to adopt. He should prefer something more scientific. He wished to say, before the discussion ended, that he did not intend to let the matter rest. He meant to test it most thoroughly by the methods best calculated to arrive at a correct solution of the problem, and would report the result at the next annual meeting of the Association.

Mr. Allen was proceeding to advocate the making of water gas as a cure for the troubles complained of, whereupon

Mr. Forstall said: Doubtless a man may be cured of the headache by cutting off his head; and there is no doubt in the world that if we rebuild our works and go to making water gas we shall cure the stoppages of our ascension-pipes. But we are looking for a cheap remedy, and I am afraid the one proposed by Mr. Allen is a little too expensive.

Mr. Allen: It seems to me that if I can show how gas-works can be run without the trouble complained of—and this is the subject of discussion—I am doing good service.

Mr. Cartwright: I would like to ask Mr. Allen if he has any stand-pipes at all.

Mr. Allen: We have one stand-pipe for 100,000 feet. It is only a 7-inch pipe, and we have no trouble with it whatever.

Mr. Cartwright: And you do not use any coal except for fuel?

Mr. Burtis said what they were all trying to get at was this: How to keep the stand-pipes free in manufacturing gas from bituminous coal, and not from anything else; so that those who did not have any difficulty had no need of the remedy. He asked Mr. Forstall if he had noticed at what particular point of time the stoppages in his pipes took place after the retorts were charged—how soon after the charge was put in?

Mr. Forstall said it was absolutely impossible to tell, because the stoppages were not constant. They would run over from one charge to another. The pitch stoppages sometimes occurred in the middle of the charge, and sometimes at the end. Sometimes the pipes would be stopped at the beginning of the next charge, because the pitch had commenced to form above, and they had to clean the stand-pipes between the charges. The stoppages from dry soot almost invariably occurred within the first half hour after the charge was put in. They came most suddenly. He had tried very often to discover some regularity in their appearance, with reference to the periods of distillation, but had never been able to make a satisfactory investigation on the point.

Mr. Burtis said that in some little experience that he had had of this kind, he had noticed that the stoppages appeared to present themselves shortly after the retorts were charged, but not universally so. They very rarely had stoppages in the bridge or dip pipes; they mostly occurred in the stand-pipes, a short distance above the mouthpieces or on the lids of the retorts at the mouthpieces. Some time ago he noticed that condensation took place in the hydraulic main very rapidly. He therefore adopted a device of his own, and used it at every bench having a main of its own, and thus had an opportunity of observing the effect. It was an ordinary syphon arranged in such a way that the discharge from the main ran over into any vessel that happened to be lying on the retort-house floor, so that the sum total of the discharge from the main was run off immediately. He let this remain from the time the last retort was charged until the expiration of the four hours, making a memorandum of the condensation, which he found was nearly all during the first half hour after the retorts were charged The impression left upon his mind by this experiment was that if, in some way, a portion of the condensation could be got rid of, after a particular time, there would be less stoppages, because almost all the stoppages that took place were immediately after the charge, just at the time he had determined that the bulk of the condensation was taking place, and the ammoniacal liquor and tar were being formed.

Mr. W. Cartwright said he was not often troubled with stoppages, his pipes being 7 inches in diameter; but whenever he was, and it became a continuous thing, he put in check plates, and these were efficacious.

Mr. Forstall said he had used check plates with some advantage, but did not think the advantage compensated for the trouble of putting them in and taking them out, because it lengthened the time the retorts were opened, and increased the tar and pitch formed, so as to necessitate frequent cleaning. He had come to the conclusion that the good they did was not sufficient, in his case, to warrant the using of them exclusively. They gave some relief, however. For instance, they would be a source of relief from a portion of the stoppage in the stand-pipes, but would have no effect upon the bridge and dip pipe stoppages.

Mr. Cartwright: We have not had any trouble with our dip-pipes whenever we have used the check plates.

Mr. Butterworth (to Mr. Forstall): Did you keep any record by which you could tell whether, when you had stopped pipes, you did not have a better yield and make more gas? My idea is that whenever you have stopped pipes you get a better yield.

Mr. Forstall said it was just the reverse with them. He very rarely had stopped pipes in the summer when they always had their largest yield, because in order to save the men they ran 4½ instead of 4 hour charges, yielding from 5·20 to 5·50 cubic feet per pound of coal carbonized. Often after the retorts had been idle all day, they had run up to 5·80 cubic feet to the pound. At such times they had no stoppages. On the contrary, in winter, when they were troubled with naphthaline, they had to run the heats down a little for the sake of getting rid of it. At those very times he had this trouble with the stoppage of the pipes.

The President said so far as his works were concerned, they had very little trouble from this cause. It had never attracted his special attention. Just before putting in the charge the men often used an instrument such as, he believed, was used by Mr. Forstall, to clean out the accumulated material. They had no trouble, however, so long as they used the regular coal, although they had some trouble when they used another kind of coal, to which he had referred.

Mr. Somerville asked Mr. Forstall if he had arrived at the conclusion that the trouble was the fault of the gases that came up the pipes.

Mr. Forstall said it was not the gases, but the vapours. He was satisfied that the gas, after it left the retort, lost its heat very rapidly. The heat was retained by the vapours that formed the tar and pitch. He thought these had a very high heat, and if they could arrest and cool them there would not be the heat which went to form the pitch, and this would entirely prevent the stoppages in every case. What he was looking for was not a partial remedy which would relieve the stand, bridge, and dip pipes when they were stopped, but for something which would entirely and inevitably prevent the stoppage in any part of the apparatus; and from experience and thinking the matter over he did not consider that this could be accomplished unless the particular vapours which did the mischief could be stopped and taken out at a point where they could be easily intercepted. He had no doubt whatever that the cooling of the ascension-pipe, as effected by Mr. Wood, afforded relief by that very action. His (Mr. Forstall's) difference with Mr. Wood was merely a difference of detail, not a difference of principle. Mr. Wood accomplished in his ascension-pipes what he (Mr. Forstall) wanted to accomplish in the mouthpiece.

Mr. Coggshall said he had not for years and years had a stoppage of a bridge or dip pipe; but there had been some stoppages at the mouths of the retorts. He had a ½-inch hole in every lid, and if there was any stoppage he could run a rod in without taking the lid off, and thus at once relieve the stand-pipe. No gas to speak of was lost, for it was all done in a moment. The hole was stopped up with mortar.

The discussion was then brought to a close, and a vote of thanks passed to Mr. Forstall for his very interesting paper.

The *Sheffield Independent* says that the first meeting of the Committee of the Water Consumers Defence Association since the recent decision given by the Master of the Rolls in regard to the supply of water to baths was held on Saturday, the 20th inst., when, after considerable discussion, it was unanimously decided to lodge an appeal. The Solicitor to the Association was accordingly instructed to take the necessary steps; and it is probable that the appeal will come on for argument in the Court of Appeal early in the coming year. In the event of an adverse decision being again given, the Committee will enter into an inquiry to test the reasonableness of the charge now made by the Company for water supplied to baths.

The Disposal of Surplus Gas Profits at Salford.—At a recent meeting of the Salford Town Council it was reported that a statement had been submitted to the Gas Committee, in conformity with the provisions of the Salford Improvement Act, 1862, showing the proportionment among the three districts of the borough of the clear net profits of the gas department during the year ended the 25th of March last in proportion to the gas-rental of each district. The proportionment was as follows:—Salford, £5577 9s. 2d.; Pendleton, £2343 1s.; Broughton, £2079 9s. 2d. The minutes of the Gas Committee stated that a letter had been received from the Barton Local Board, asking that the Committee would reconsider the question of charging a differential rate. The Clerk was instructed to inform the Board that the Committee do not at present contemplate any alteration of the differential rate charged to the out-districts.

The Water Famine in the United States Ended.—In reference to our American correspondent's letter, published in the Journal for the 16th inst., he writes that the copious rains during the latter part of October relieved, in a great measure, the anxiety felt on all sides at the continuance of the drought, which has existed to a greater or less extent during the past Summer and Fall, in various parts of the United States. Further rains during the first part of November have restored to its normal condition the water supply of most of the cities. In Brooklyn, N.Y., on Nov. 5, the consumption of water was 26,266,206 gallons, the amount sent out for the same day last year being 31,852,979 gallons. Doubtless the scarcity of water this year will lead the authorities to improve their system of water supply, so as to possess not only a greater number of sources from which to draw, but also more storeage room.

Chertsey Gas Consumers Company, Limited.—The eighteenth annual meeting of this Company was held on Thursday, the 18th inst.—Mr. J. Bartholomew in the chair. The Secretary (Mr. John Moir) read the Directors report, which stated that the business of the Company was gradually increasing, and now permitted the payment of a dividend of 10 per cent., absorbing £790 of the balance of revenue account—£1408 11s. 4d. The report also announced a reduction in the price of gas, of 3d. per 1000 feet, from the beginning of next year. The Chairman, in moving the adoption of the report and accounts, referred at great length to the working of the Company during the past year, and also to their gradually extending operations. The motion having been agreed to, the retiring Directors (Messrs. B. Smith, H. Lovett, and J. Borsley) and Auditor (Captain E. Dyer) were re-elected, and a vote of thanks was accorded to the Officers of the Company, on whose united efforts, the Chairman said, so much of the success of the undertaking depended. Mr. Moir, in acknowledging the compliment, assured the meeting that the officers, one and all, valued very highly the mark of approval thus bestowed; they were glad that their services were appreciated, and trusted they might not be found wanting in the future. A vote of thanks to the Chairman and the rest of the Directors terminated the proceedings.

Hull Corporation Water Supply.—At the fortnightly meeting of the Hull Water-Works Committee, held on Friday, the 19th inst., the Engineer (Mr. D. Maxwell) presented a report on the present position of the water undertaking. After referring to the sources of supply and the general character of the water sent out to the consumers, the report gave an abstract of the Treasurer's accounts for the past ten years, showing that the average expenditure under the control of the Engineer was, from 1871 to 1876, £14,932 9s. 2d.; expenditure not under the control of the Engineer, £11,171 6s. 5d.—total, £26,103 15s. 7d.; average income, £20,989 7s. 2d.; leaving a deficiency of £5114 8s. 5d. The average expenditure for the years 1876 to 1880 was £22,560 8s. 8d.; average income, £26,743 17s. 3d.; showing a surplus of £4183 8s. 7d. The expenditure included payments to the borough fund of an average annual sum of £2560 12s. 9d. in the five years 1871 to 1875, and an average of £2559 5s. 6d. yearly in the five years 1876 to 1880. This payment is required by the Corporation Act of 1843. With regard to the probable future increase in the consumption of water in Hull, the report stated that, with increased trading facilities, Hull would, by the end of the present century, probably contain a population of a quarter of a million—*i.e.*, would increase at an average rate of about 5000 annually. If so, it would then be requiring at least 50 per cent. more water than at present—say 7½ million gallons per day. In view of such an extension, the Engineer was of opinion that a new pumping-engine and other works would probably be required within the next few years.

APPLICATIONS FOR LETTERS PATENT.

4795.—Dieterich, C. F., Baltimore, U.S.A., "Improvements in gas making apparatus." (Complete specification.) Nov. 19, 1880.

4817.—Lowe, C., and Gill, J., Manchester, "Improvements in the manufacture of certain derivatives from coal tar products." Nov. 20, 1880.

4819.—Müller, H. L., and Adkins, W., Birmingham, "Improvements in or additions to gas-engines." Nov. 20, 1880.

4854.—Brydges, E. A., Berlin, "Improvements in apparatus for automatically igniting and extinguishing gas jets or flames, and for regulating the flow of gas to the burners." A communication. Nov. 23, 1880.

4881.—Simon, L., and Wertenbruch, F., Nottingham, "Improvements in gas motor engines." Nov. 24, 1880.

4891.—Jamieson, J., Thornliebank, Renfrew, N.B., "Improvements in gas-burners." Nov. 25, 1880.

4908.—Grant, H. G., Manchester, "Improvements in the manufacture of ammoniacal salts." A communication. Nov. 25, 1880.

PATENT WHICH HAS PASSED THE GREAT SEAL.

3607.—Jenner, H. W. T., Handsworth, Stafford, "Improvements in gas-engines." Sept. 4, 1880.

Return to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Nov. 24, 1880.

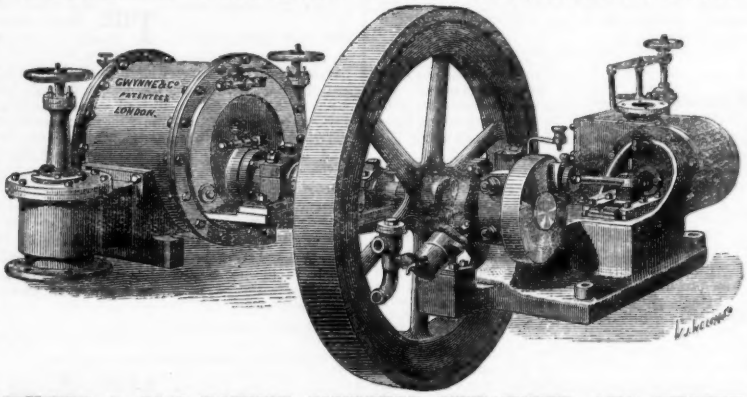
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company	Notting Hill	17·1	16·4	16·9	10·8	8·3	9·6	0·2	0·0	0·1	None.	In excess.
	Camden Town	17·2	16·3	16·7	16·1	13·1	15·2	0·1	0·0	0·0	"	"
	Dalston	17·2	16·6	16·9	15·4	11·0	13·7	0·0	0·0	0·0	"	"
	Bow	17·0	16·2	16·7	12·6	10·3	11·6	0·2	0·0	0·1	"	"
	Chelsea	16·7	16·7	16·7	16·9	13·9	15·5	0·7	0·0	0·4	"	"
	Kingsland Road	17·5	16·5	16·9	17·1	11·3	16·1	0·6	0·1	0·3	"	"
	Westminster (cannel gas)	21·5	20·6	21·0	21·3	13·8	16·3	0·0	0·0	0·0	"	"
South Metropolitan Gas Company	Peckham	17·2	16·3	16·8	11·2	9·9	10·6	0·4	0·2	0·3	"	"
Commercial Gas Company	Old Ford	17·3	16·9	17·0	16·7	11·0	13·6	0·3	0·2	0·2	"	"
	St. George-in-the-East	17·6	16·2	17·0	10·3	8·0	8·9	0·2	0·0	0·1	"	"

(Signed) T. W. Keates, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



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Have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the Combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is —"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

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GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Rye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

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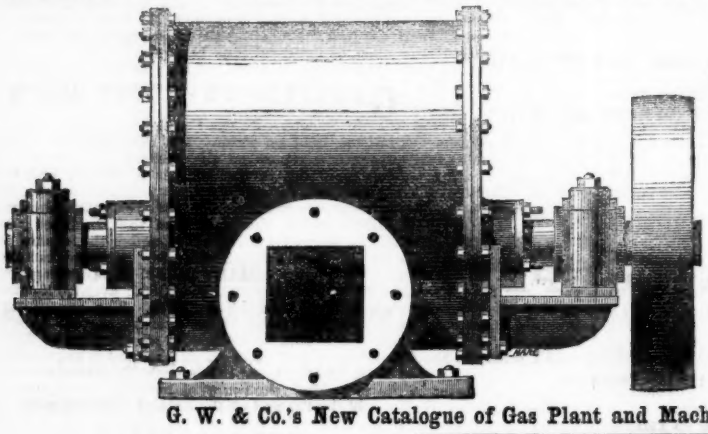

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TAR, LIQUOR, AND OTHER PUMPS,
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G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c.
Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, a Situation as Leading Gas STOKER, understands Engines and Exhausters. Used to London and Country Gas-Works. 12 years experience. Good testimonials. Aged 34, and married.
Address J. P., 3, Cottage Road, Cambridge Road, KILBURN, N.W.

WANTED, by a Young Man (married), a Situation in a Gas-Works. Is the son of a Manager, and is a good Main and Service Layer. Can do any Fittings in the Retort-House; also can Fix and Read Indexes of Meters, and has had experience both at Lathe and Vice. Very steady.
Apply to the MANAGER, Gas-Works, Crayford, KENT.

WANTED.—The Advertiser, a Young Man, aged 39, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works, or SUB-MANAGER of a large Works. Has a thorough Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references.
Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO TAR DISTILLERS, &c.

ADVERTISER is open for an Engagement as MANAGER of WORKS. Several years practical experience of the Distillation of Tar and the Manufacture of Sulphate of Ammonia. No objection to go abroad.
Address No. 703, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser, having had seven years practical experience in the Manufacture and Distribution of Gas, and all matters connected therewith, including Main-Laying and Gas-Fittings, use of Test Apparatus, also Office Work and Collecting, desires a RE-ENGAGEMENT in any suitable capacity. Fair Draughtsman. Aged 25. Total abstainer. Excellent references.
Address No. 702, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Newcastle-under-Lyme Gas Company, a good, efficient, and steady GAS-FITTER. General good character indispensable.
Applications and references to be sent to the undersigned.
W. WINSTANLEY, Engineer and Manager.

TO COLLIERY PROPRIETORS.

WANTED, to represent a good York-shire or Derbyshire Colliery on the South-Western line. Salary, or commission and expenses.
Address SALESMAN, at Horncastle's Central Advertisement Offices, 61, CHEAPSIDE, E.C.

WANTED, a competent Working MANAGER for a small Gas and Water Works. One who has occupied a similar situation or has had charge of exhausting machinery preferred. Wages £2 per week, with free house, coals, and gas.
Apply, by letter, stating previous experience, &c., to E. E., 11, Delahay Street, LONDON, S.W.

WANTED immediately, by the Glossop Gas Company, a thoroughly experienced, efficient, and steady Workman as MAIN and SERVICE LAYER and METER REPAIRER. Must be able to use a Soldering Iron or Blow-pipe, and Read the Indices of Meters. Wages 28s. per week.
Applications, stating age and experience, to be made to the undersigned.
JAS. DALGLIESH, Engineer and Manager.

AMMONIA PLANT FOR SALE.

A COMPLETE Plant in thorough working order, to make up to 1½ tons daily; or Saturator and Crystallizing Pans will be sold separately. Also Cornish and other Boilers, Tar Stills, Hydraulic Press, Iron Tanks, Tangye's Pumps, &c., for Sale, and Waterside Premises to be Let.
Apply to T. V. CLARKE, on the premises, Trundley Lane, Surrey Canal, DEPTFORD, S.E.

THE Gravesend and Milton Gas Company have FOR SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. GOVERNOR, by Sugg, of Westminster.
For further particulars apply to the undersigned.
S. SOWOOD, Manager.

GAS MANAGER WANTED.

THE Local Board of Health for the district of Sowerby Bridge, near Halifax, in the county of York, require a MANAGER, competent to undertake the management of their GAS-WORKS. The annual production of gas is about 50 million feet.
Applications must be sent in writing to me, the undersigned, Clerk to the Board, not later than the 9th day of December, 1880, endorsed "Gas Manager" (on which day the Gas-Works Committee of the Board will meet to consider such applications), and must state age, present occupation, experience, and salary required, and must be accompanied by testimonials.
GODFREY RHODES, Solicitor,
Clerk to the said Board.
Town Hall Chambers, Sowerby Bridge,
Nov. 26, 1880.

THE Redcar Gas Company having discontinued their Marske Works, have FOR IMMEDIATE SALE Four Cast-Iron PURIFIERS 8 ft. diameter by 3 ft. deep, with strong Wrought-Iron Covers, Centre-Valve, &c. A 9-in. Cast-Iron PIPE CONDENSER, 21 Columns of Pipes 18 ft. high. About 120 ft. of 9-in. Wrought-Iron FOUL MAIN (nearly new). An 18-in. HYDRAULIC MAIN, RETORT-FITTINGS, &c.
The above are in very good condition, and are suitable for erection elsewhere.
Further particulars may be had on application to the undersigned,
M. FLIGG, Secretary.

THE Gloucester Gas Company have the undermentioned APPARATUS for Sale:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

MALTA.

LIGHTING BY GAS VALLETTA, FLORIANA, MARSA, SENGLEA, COSPICUA, & VITTORISSA.

SEALED Tenders will be received at this Office until noon of Monday, June 3, 1881, for Lighting by Gas the Streets of Valletta, Floriana, Marsa, Senglea, Cospicua, and Vittorissa, for a period of Ten years, to date from May 15, 1882.
Tenders to be on the established printed form supplied by this Office.
The conditions of the contract and further particulars will be made known on application to this Office; and to the Office of the Crown Agents for the Colonies, Downing Street, London.
Each tender is to be accompanied with a deposit of £200, which sum is to be temporarily lodged with the Receiver-General, to be dealt with as stated hereunder; and no notice will be taken of any tender unless the due fulfilment of this condition be found endorsed thereon by that Officer.
The deposit thus made shall be forfeited in favour of Government should the party tendering, or the surety, fail to appear for the stipulation of the requisite contract in the event of the tender being accepted, within three days from the day of the notice given to him to that effect.
The deposits of the unsuccessful tenderers shall be returned to them immediately after notice will have been given to the party whose tender will have been accepted.
Any notarial fees will have to be paid by the Contractor.
The undersigned retains the power of accepting or rejecting all or any of the tenders received.
C. RAPINET,
Acting Auditor-General and
Director of Contracts.
Office of the Auditor-General and Director of Contracts, Valletta, Oct. 7, 1880.

HEAT, LIGHT, AND VENTILATION.

ALEXANDRA PALACE.

A Trade Exhibition and Mart of Heating, Lighting, and Ventilating Apparatus, and Appliances connected therewith, will be held in the Great Central Transept and adjoining Exhibition Halls, from Dec. 22, 1880, to Jan. 11, 1881.
Apply for space and prospectuses to Mr. PHILLIPS SMITH, Alexandra Palace.

THE Hindley Local Board are prepared to receive OFFERS for One GASHOLDER, 50 ft. by 20 ft., with Six Pillars, Counterbalance-weights and Chains to each, wrought-iron Lattice Girders complete, with 8-in. Inlet and Outlet Connections; One Walker's Patent 8-in. Valve on outlet; One cast-iron Syphon Pump on inlet; 226 ft. of 8-in. Gas-Main Pipes, socket jointed. The whole of the best materials, by D. Howard and Son, West Bromwich; in use only six years.
Can be seen at Platt Bridge, Hindley.
Communications to be made to the undersigned.
By order,
STEPHEN HOLT, Clerk to the Board.
Offices, Cross Street, Hindley, Nov. 11, 1880.

BOROUGH OF OVER DARWEN—GAS AND WATER DEPARTMENT.

THE Gas and Water Committee of the above Corporation hereby invite TENDERS for the Supply of all the Cast-Iron MAINS required for Gas and Water purposes during a period of One year, from Jan. 1, 1881.
Specifications and forms of tender may be obtained from the undersigned.
Tenders, endorsed "Tender for Pipes," to be sent to C. Costeker, Esq., Town Clerk, Darwen, on or before Dec. 13, 1880.
THOS. DUXBURY, Manager.
Gas-Works, Darwen, Nov. 26, 1880.

COLCHESTER GAS COMPANY.

THE Directors of the Colchester Gas Company are prepared to receive TENDERS from competent persons for the Construction of a Brick GAS-HOLDER-TANK in puddle, and other works in connection therewith.
The drawings and specification may be seen, and forms of tender obtained, on payment of one guinea (which will be returned if a *bonâ fide* tender be made), at the Offices of the Gas Company, Queen Street, Colchester, or of Mr. G. W. Stevenson, Engineer, 33, Parliament Street, Westminster; and sealed tenders, properly endorsed, must be delivered, addressed to J. B. Harvey, Esq., J.P., Chairman of Directors, at the Offices of the Company, on or before Friday, Dec. 17, 1880.
By order,
J. T. BROWNING, Manager.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Plymouth and Stonehouse Gaslight and Coke Company are prepared to receive TENDERS for the Purchase of the surplus TAR produced at their Works, for One or Three years, from the 1st day of January, 1881. A separate quotation should be named for each of the aforesaid periods.
The Company will deliver the tar through their main into the Contractor's tank-vessels, at the Creek, Sutton Pool, or into his carts on their Works free.
Payments to be made in cash monthly.
The Directors will require the Contractor to sign a contract, and give security for the faithful performance of his contract.
Further particulars can be obtained on application to the Secretary, at the Company's Offices, 1, Athenæum Terrace, Plymouth, to whom sealed tenders, endorsed "Tender for Tar," are to be sent on or before Wednesday, the 8th of December next.
The Directors do not bind themselves to accept the highest or any tender.
By order,
JOHN THOMAS, Secretary.
Gas Offices, 1, Athenæum Terrace, Plymouth,
Nov. 26, 1880.

BROMLEY GAS CONSUMERS COMPANY.
(Incorporated by Act of Parliament in 1865.)

ADDITIONAL CAPITAL.

NOTICE is hereby given that under the powers conferred by the Bromley Gas Act, 1879, the Directors are prepared to receive TENDERS for the Purchase of 400 ORDINARY SHARES of the nominal value of £10 each, in lots, not being less than five of such Shares, or a multiple thereof.
The Shares tendered for will be entitled to a dividend not exceeding 7 per cent., except as in the said Act is provided.
Conditions of sale and forms of tender may be obtained upon application to the Secretary of the Company, at the Works, Bromley, Kent; or of Messrs. Latter and Willett, Market Square, Bromley, Kent; Messrs. Robarts, Lubbock and Co., 15, Lombard Street, London; or Messrs. Mortimer and Son, 4½, Warnford Court, London.
Tenders must be sent in not later than Wednesday, Dec. 1, 1880, at Three o'clock in the afternoon, addressed to the undersigned, at the Company's Works, Bromley, Kent.
GEORGE H. OSBORN, Secretary.
Bromley, Kent, Nov. 8, 1880.

GARSIDE'S IMPROVED MAIN
DRILLING CLIP.

No. 1 takes from 2-in. to 6-in. Mains.
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GARSIDE'S REGISTERED TUBE-VICE takes ¾ brass to a 2-in. Socket.

May be had direct from the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

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UPPER GROUND STREET, LONDON, S.E.,
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CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,
SOCKET-PIPES FOR GAS OR WATER PURPOSES,
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RAIN-WATER PIPES AND GUTTERS,
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LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,
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ENGINEERS AND CONTRACTORS
FOR
GAS AND WATER-WORKS,
WHITESTONE IRON-WORKS,
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REFERENCES TO UPWARDS OF 400 WORKS.

MR. CORBET WOODALL, C.E.,

Has Removed his Office to

PALACE CHAMBERS, BRIDGE STREET,

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BIRTLEY IRON-WORKS

AND

PELAW MAIN COLLIERIES

Have REMOVED their London OFFICES from No. 101, Cannon Street, to No. 46, Cannon Street.

Their Warehouse for Gas and Water Pipes and other Castings is at Scott's Wharf, Bankside, SOUTHWARK.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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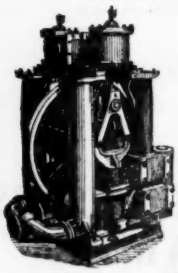

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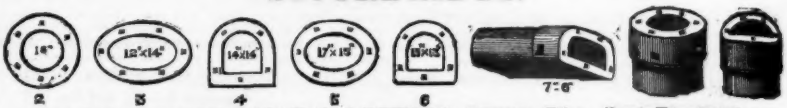

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See Professor FOSTER'S *Article on "The Corrosion of Iron" in* JOURNAL *of March* 30, 1880.

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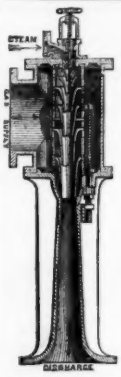

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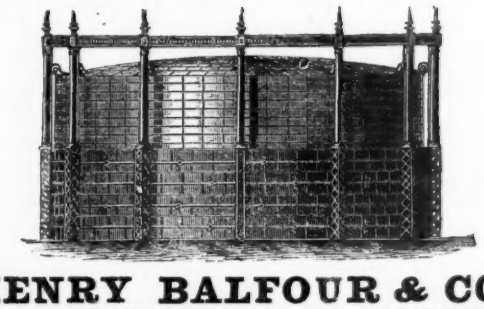

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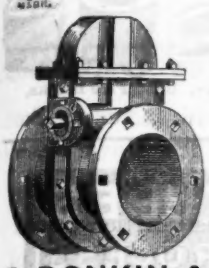

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[*As Illustrated and Described in the* JOURNAL *for May* 4.]

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IMPROVED COMPENSATING GAS-METER.

HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

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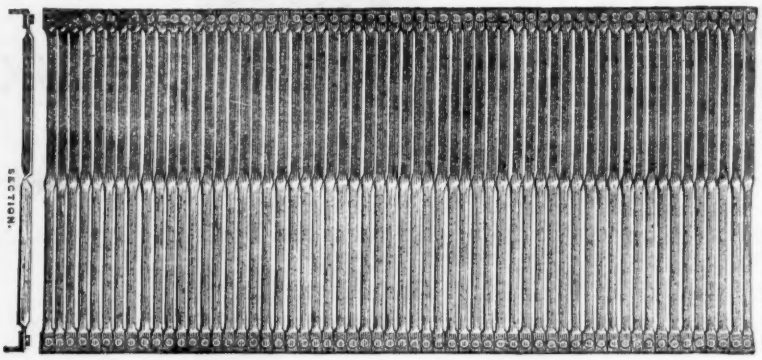

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Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.

Full Particulars on Application.

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Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.

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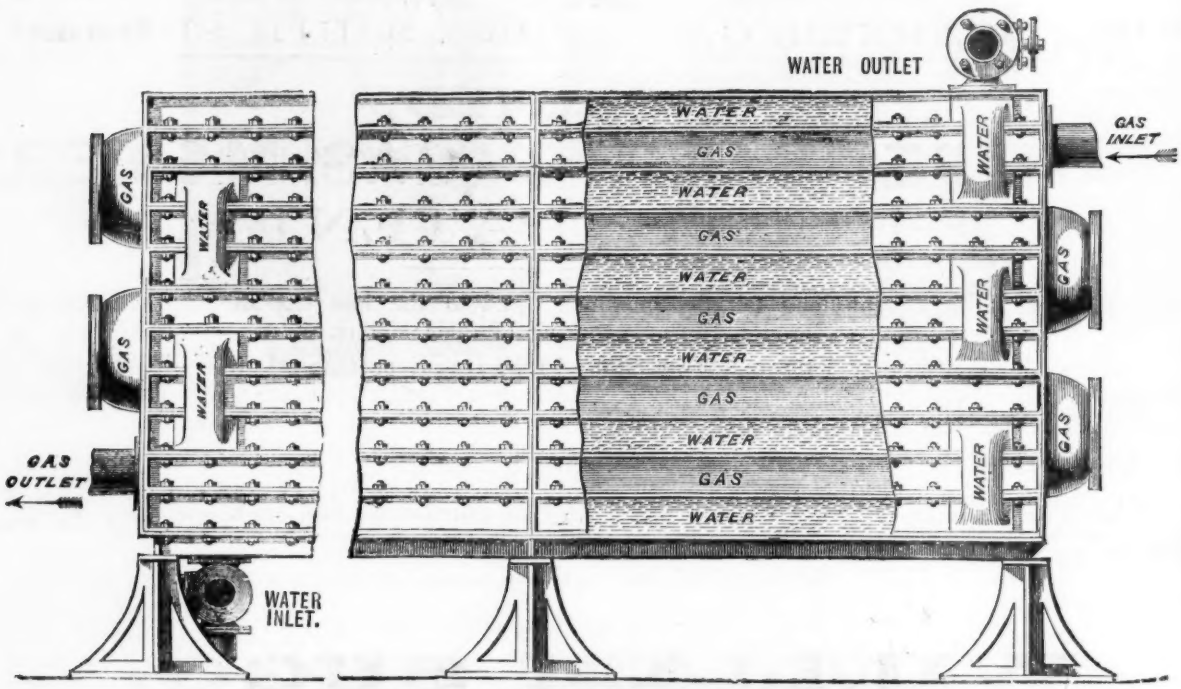
Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.



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[*See* JOURNAL for Nov. 25, 1879.]

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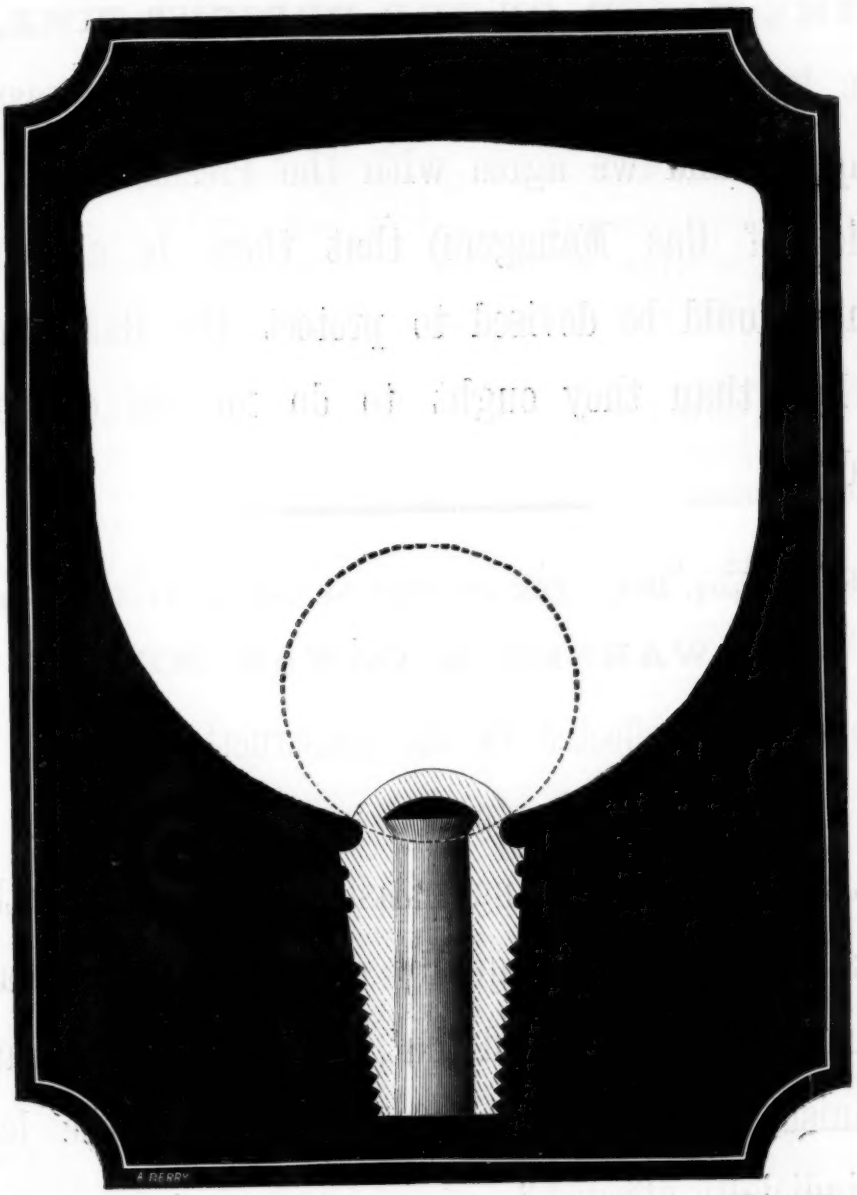
Secured by Letters Patent in 1838, and by Two subsequent Patents.

Admirably suited for Public or Private Lighting.



Unrivalled for Brilliancy and Economy.

Gives the Highest Result per Cubic Foot of any Flat-Flame Burner in the Market.

The Substance of which this Burner is made is not affected by Heat, Water, or Acid.

For Prices and Particulars, apply to

WILLIAM SUGG,
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Varying & Unvarying Meters.

On the 23rd of June, 1874, "THE JOURNAL OF GAS LIGHTING," when referring to

"THE METER OF THE PRESENT TIME," said:

"We know how easily it can be made to measure against the Company, and we agree with the President (of the British Association of Gas Managers) that there is a necessity that something should be devised to protect the Gas Company from getting less than they ought to do for the quantity of Gas Consumed."

On the 5th of January, 1875, "THE JOURNAL OF GAS LIGHTING," when referring to

"THE WARNER & COWAN METER," said:

"The changes effected in the construction of the Wet Meter are such that it now occupies a position which it never held before—that of an unvarying measure. . . . Both Company and Consumer are now equally protected, perfect accuracy of measurement is obtained, and that, too, without the least increase of mechanism, or the action of the Meter in the least degree being prejudicially affected."

W. & B. COWAN,

WET & DRY GAS-METER MANUFACTURERS,

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The understated declaration, with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the FLAT-FLAME BURNER into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

The above declaration was received with marked applause by the crowded meeting.

BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power have been fixed; **SINCE WHICH WE HAVE RECEIVED ORDERS FOR TWENTY-SIX MORE.**

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our 80*-candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.,* 1879, *were used by our competitor; and higher than the* 80*-candles power Argands.*

THE BRITISH ASSOCIATION OF SCIENCE REPORT (1878) on "*The Best Means for the Development of Light from Coal Gas of Different Qualities*" showed that of all the two or three score Burners reported upon for Cannel Gas (which included all Burners of repute in the market), BRAY'S YIELDED THE GREATEST AMOUNT OF LIGHT, and had the fewest defects, such as "smokes," "blows," &c., recorded against them, and were the lowest in price.

The Highest Results obtained by the Burners of the parties here named were—

BRAY'S FLAT-FLAME	**28·6 candles per 5 cubic feet of Gas.**	}	**Quality of Gas by Standard Burner, 26 Candles.**
SUGG'S ditto	**25·56 „ „ „**		
SUGG'S DOUBLE-RING ARGAND . .	**23·33 „ „ „**		

[See *Journal of the Society of Arts*, Feb. 7, 1879, pp. 184, 187, and 189.]

The Report on Burners for Common Gas (1880) confirms the above unparalleled testimonial, by again placing us at the head of all Flat-Flame Burner Makers.

NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting. Also more than 70 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

Nov., 1880.

THE

MANN & WALKERS' PATENT SCRUBBER.

Extensive use. The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required. By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained. The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased. The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required. The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works. There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

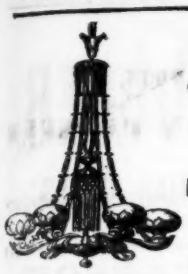
Reserve purifying power contained. There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed. The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee. They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*



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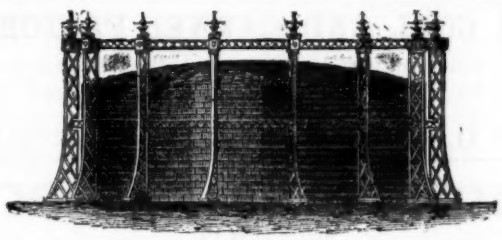
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

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TIPTON, STAFFORDSHIRE.

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MANUFACTURERS OF

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AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

HYDRAULIC, GAS, AND GENERAL ENGINEERS,

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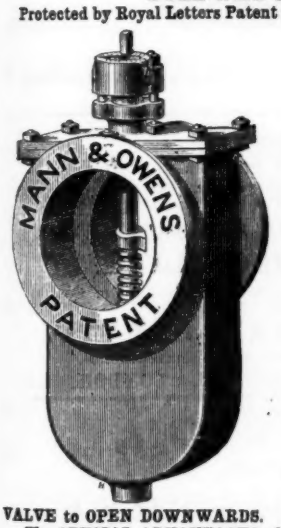
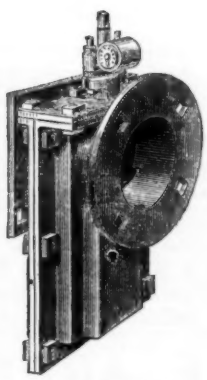
MANN & OWENS PATENT SCREW AND CAM, ALSO IMPROVED FULL-WAY RACK AND PINION GAS-VALVES.

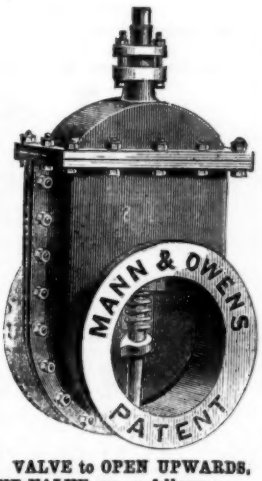
Protected by Royal Letters Patent in England, France, Belgium, & the United States of America.



VALVE to OPEN DOWNWARDS.



BRIDGE-VALVE for Regulating the Seal of Hydraulic Mains.



VALVE to OPEN UPWARDS.

The SPECIAL ADVANTAGES of MANN AND OWENS' PATENT VALVE are as follows:—

1. Its non-liability to become set fast through varying temperature or from the deposit from crude gas. 2. It is made absolutely gas-tight by the simple action of a screw and cam. 3. Inconvenience through the breakage of springs or wedges setting fast cannot arise. 4. The face of the Valve is scraped and cleaned of any solid matter at each operation of opening or closing.

The Valve can be had to work either in a Vertical or Horizontal position.

Every Valve is carefully tested under pressure, and warranted perfectly sound and gas-tight.

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State whether required for above or below ground, if Double Flange or Socket and Spigot Valves are wanted, or with loose Flanged Socket and Spigot pieces.

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Also makers of PILLAR-VALVES, SELF-ACTING BYE-PASS VALVES, OUTSIDE RACK AND PINION VALVES, HYDRAULIC-MAIN VALVES, DISC-VALVES, &c.

Every description of Pumping Apparatus, Hydraulic Lifts, &c., suitable for use in Gas-Works, made to order.

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NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

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Fellow of the Institute of Chartered Accountants,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

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The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

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CONSULTING GAS ENGINEER

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Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

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PLANT FOR SULPHATE OF AMMONIA,

ALSO MANUFACTURER OF

WOOD GRIDS

FOR

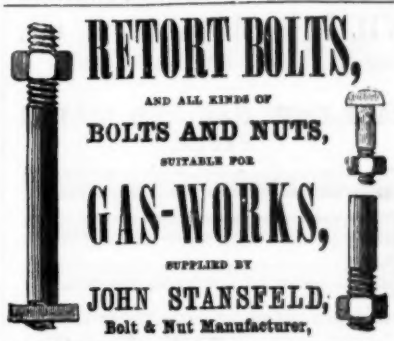
PURIFIERS AND SCRUBBERS.

BOX'S PATENT STREET GAS-LAMP

Has the following good qualities:—

1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, as *also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee, W. W. Box, Gas-Works, Crayford, Kent.



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AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

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SUPPLIED BY

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Bolt & Nut Manufacturer,

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TREES BOGHEAD.

SHOTTS BOGHEAD,

And all the first-class Scotch Cannels.

Prices and Analyses on application.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

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POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 18 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

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GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analysed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON. London Agent: Mr. F. J. LEE SMITH, Bromley, KENT.

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The HUCKNALL COLLIERY COMPANY can offer a Cannel producing a considerable quantity of Gas of good quality.

For analysis and price apply to the Company at their

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NEAR NOTTINGHAM.

LIVESEY FIRE-CLAY WORKS,

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On the most Modern and Improved Plan.

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And will shortly be erected at the New Gas-Works,

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THE DUKINFIELD COAL AND CANNEL COMPANY are prepared to deliver, to any Station, their Celebrated GAS COALS, which have a very high reputation for quantity of Gas and Illuminating Power, and make a First-class Coke.

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ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

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SUPPLIED DIRECT FROM THE

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THIS OXIDE IS GOOD IN QUALITY AND LOW IN PRICE.

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G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

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And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

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The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

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GAS COAL. GAS COAL. GAS COAL.

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This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

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Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

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DRY GAS-METERS,

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(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

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THE GAS-METER COMPANY, LIMITED,

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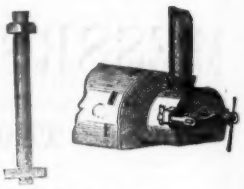
OF IMMEDIATE IMPORTANCE TO ALL GAS FACTORIES.

HARRIS & PEARSON, of Stourbridge, have an immense stock of **FIRE-CLAY GAS RETORTS,** all perfect and in good condition, and can supply orders of any magnitude, to any size or pattern, immediately on receipt of specification. Any Gas-Works disappointed by delay in the execution of Retort orders will do well to take advantage of this. Inspection invited.

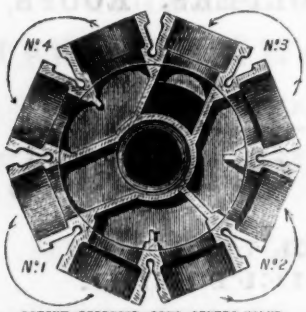
HARRIS & PEARSON manufacture best Retort Bolts, Cast Iron Retort Mouthpieces, Fittings, and Lids, Cast Iron Gas and Water Pipes, and Connections of all Shapes and Sizes.

Glazed Bricks, white and in colours, Porcelain Baths, Fire-Clay Goods of all kinds, Hard Blue Paving Bricks for Retort Houses.

Prices, Drawings, and Specifications if desired.



Please note carefully the Address:—"HARRIS & PEARSON, STOURBRIDGE," as there are other Firms similar in name.



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Sectional Plan.

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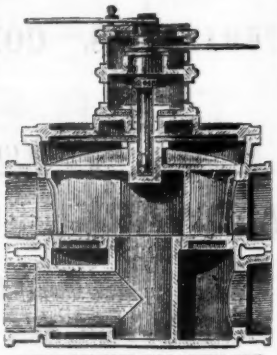
Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



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Invite the attention of Gas Companies, Corporations, and others to their

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Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

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By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

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For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

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